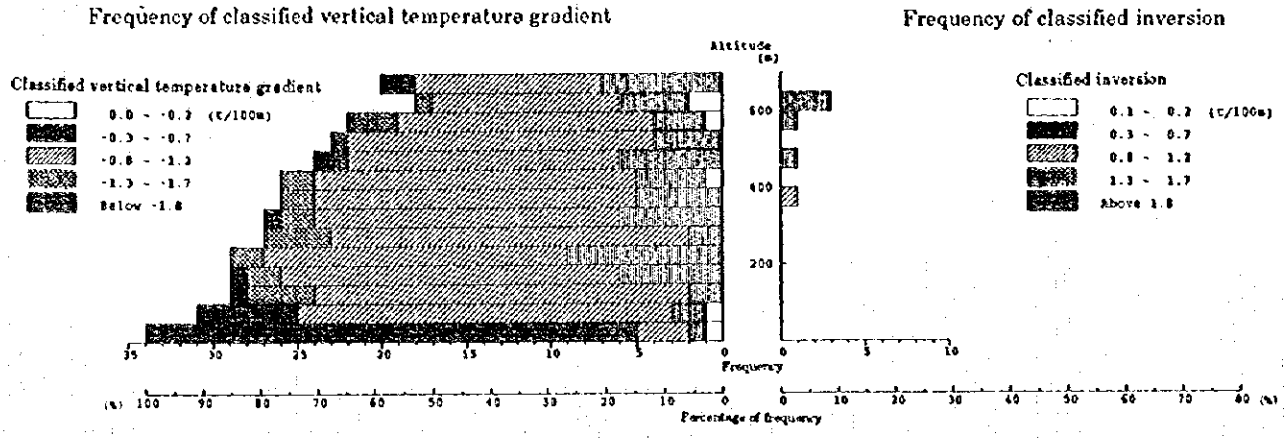
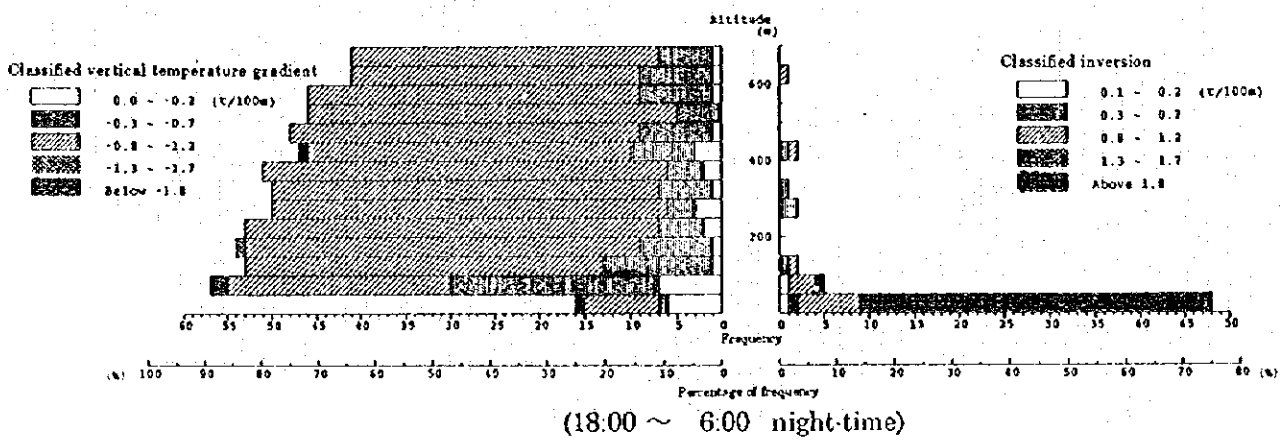
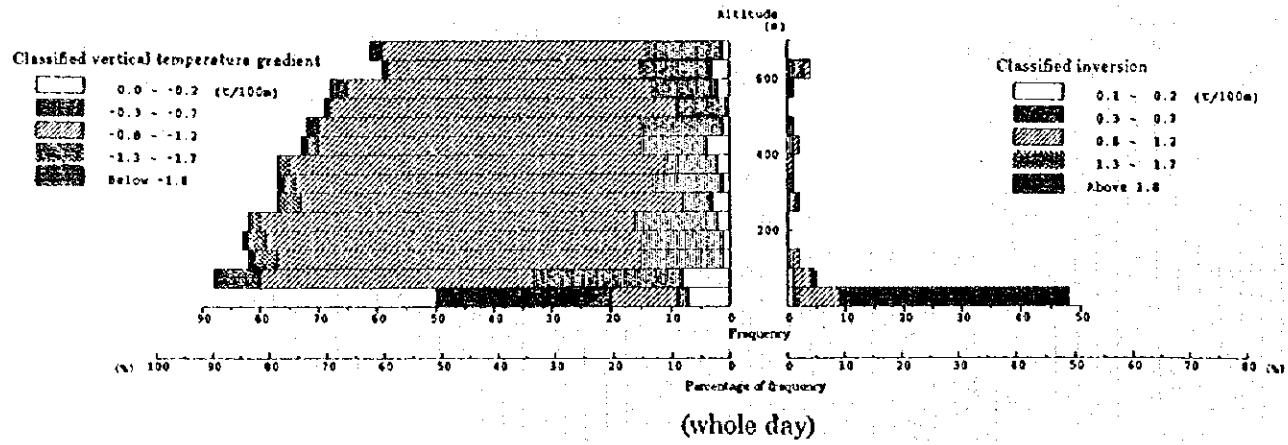


(7:00 ~ 17:00 daytime)



(18:00 ~ 6:00 night-time)



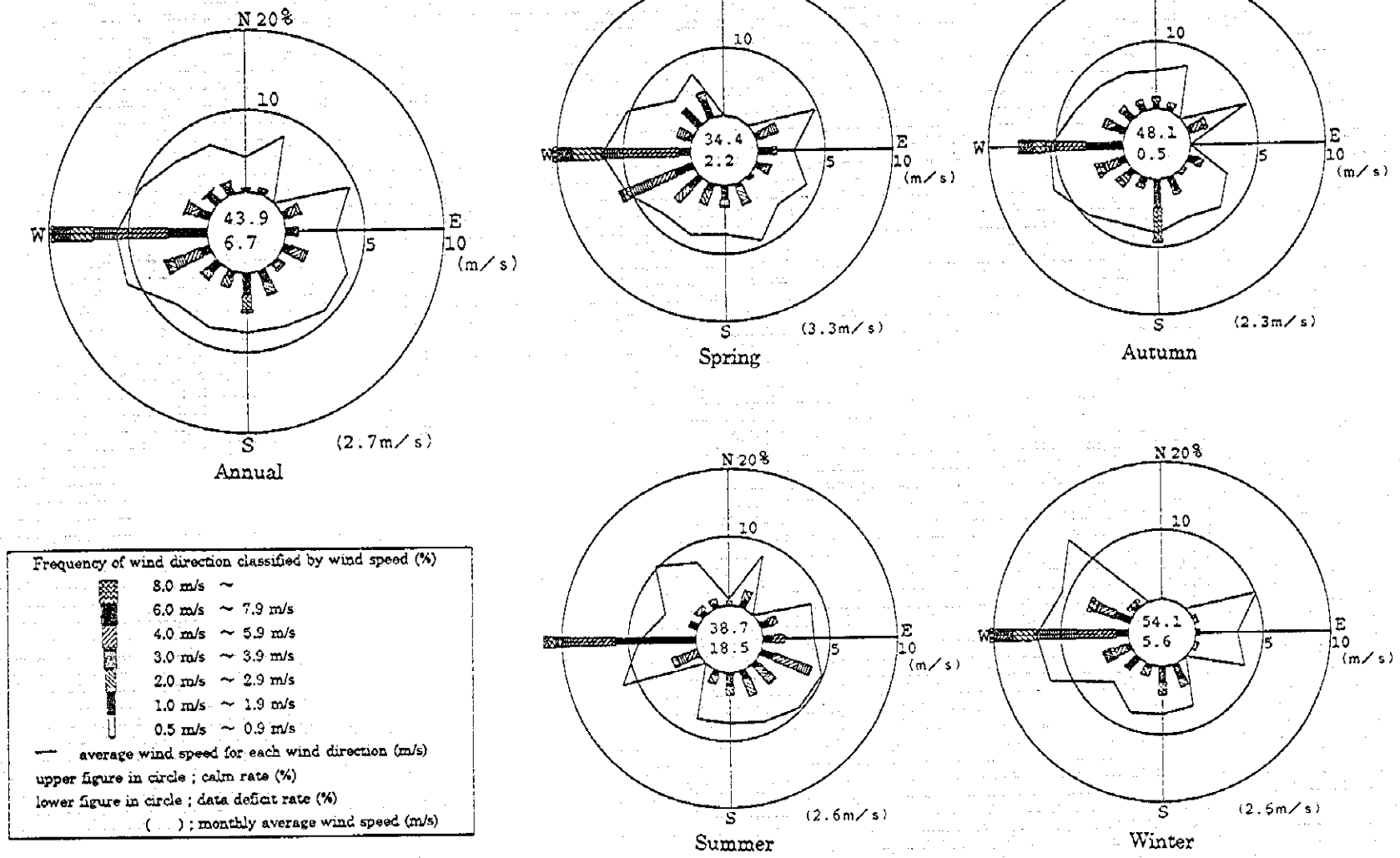
(whole day)

Observation point ; Aghdasiyeh

Observation period ; October 8, 1996 ~ October 15, 1996

February 22, 1997 ~ March 1, 1997

Fig.4.1.2-11 Diagram for the frequency of the classified vertical temperature gradient and frequency of inversion obtained by captive sonde.



Observation point ; Mehrabad

Observation altitude ; Surface

Observation period ; January, 1994 ~ December, 1994

Fig.4.1.2-12(1) Wind rose for seasonal frequency of wind direction classified by wind speed, and monthly average wind speed at each wind direction.

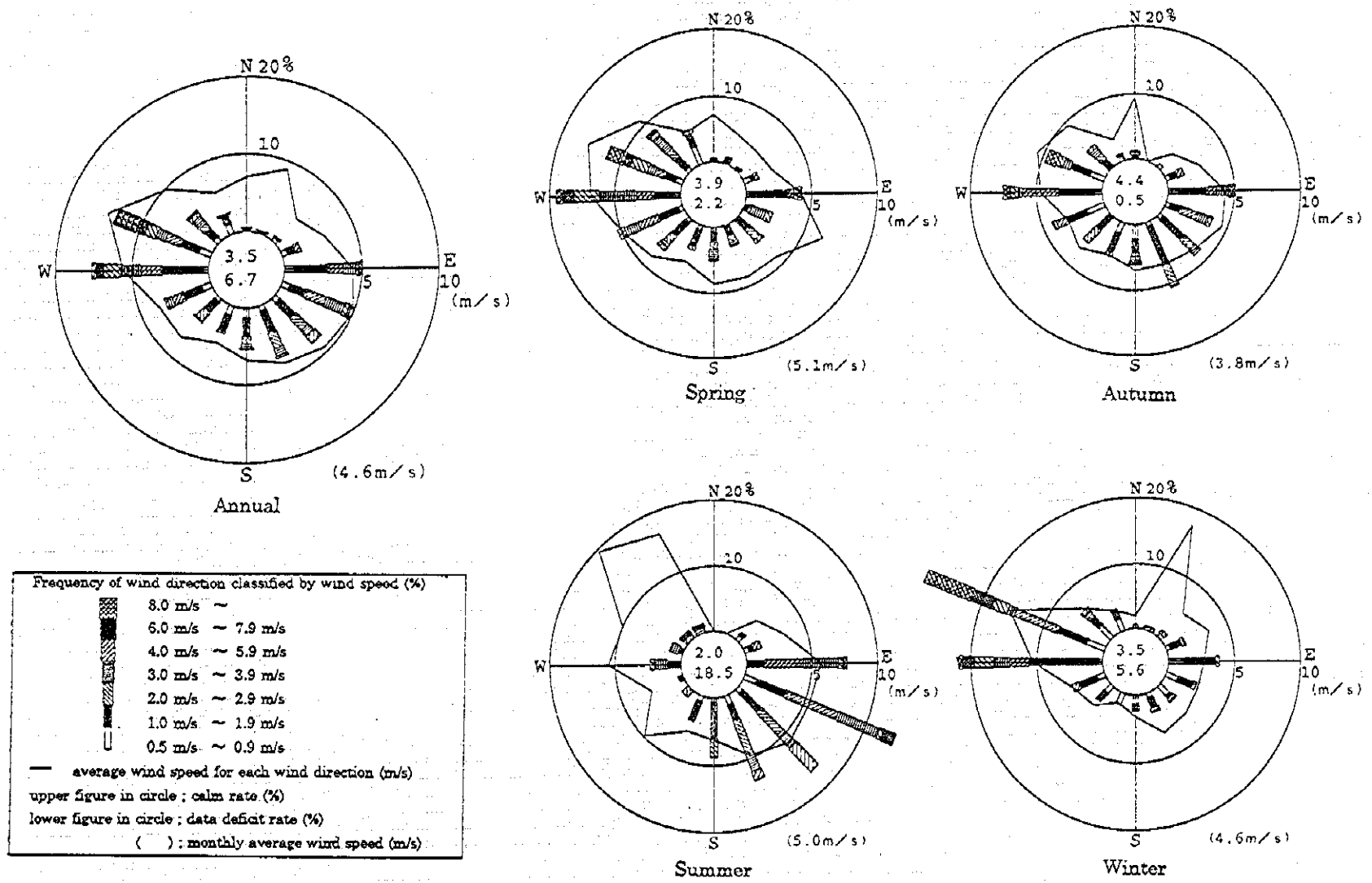
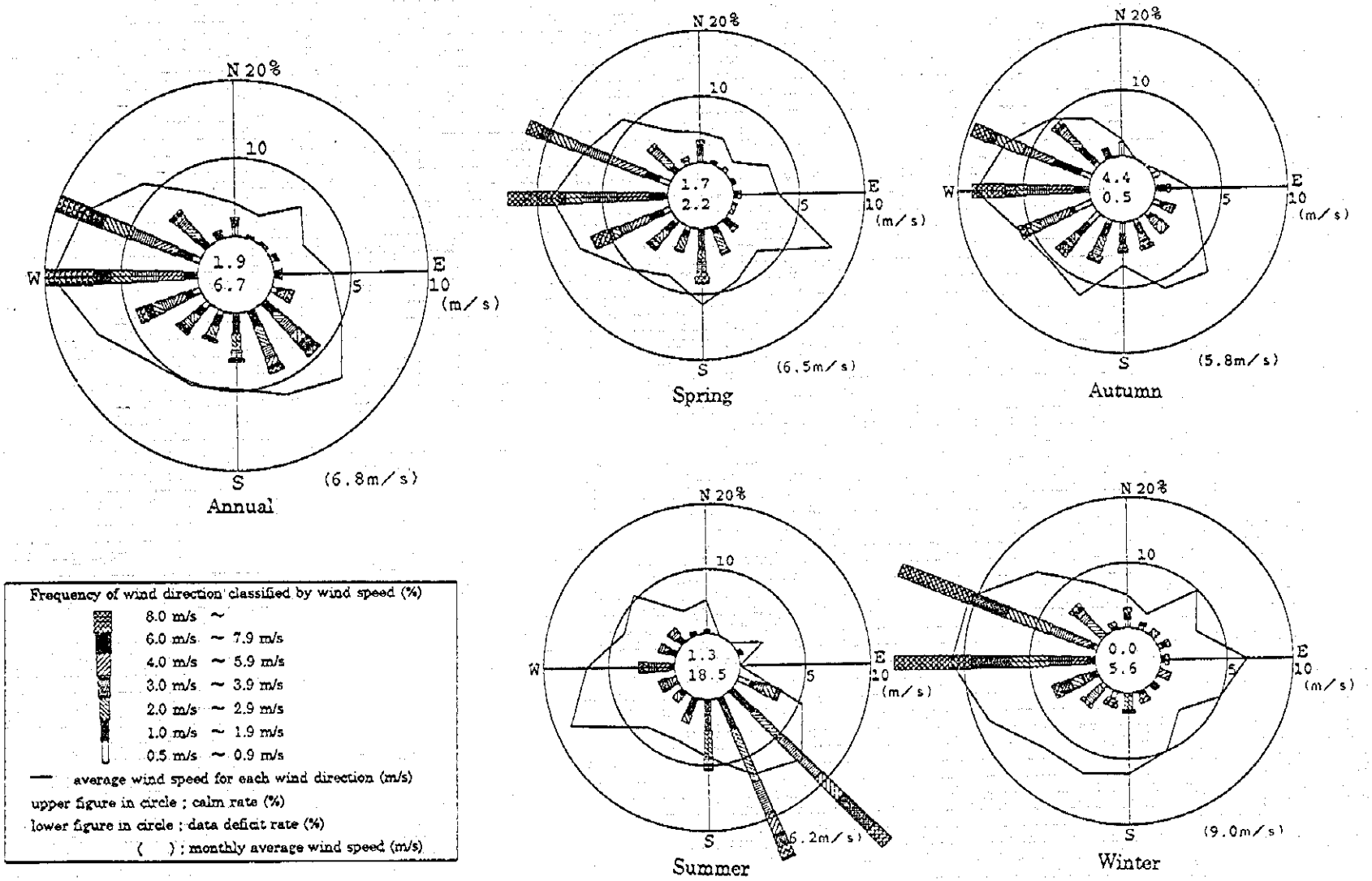


Fig. 4.1.2-12(2) Wind rose for seasonal frequency of wind direction classified by wind speed, and monthly average wind speed at each wind direction.

Observation point ; Mehrabad

Observation altitude ; 850hPa

Observation period ; January, 1994 ~ December, 1994



Observation point ; Mehrabad

Observation altitude ; 700hPa

Observation period ; January, 1994 ~ December, 1994

Fig. 4.1.2-12(3) Wind rose for seasonal frequency of wind direction classified by wind speed, and monthly average wind speed at each wind direction.

4.1.3 Characteristics of weather condition in Tehran

Based on the statistics of the observation data obtained through the field survey and existing data, the characteristics of weather condition are summarized as follows.

① The wind at Aghdasiyeh is considerably affected by the northern mountains. In the daytime, deep and somewhat strong southwesterlies go up the mountain slope. On the contrary, the wind system in the night-time is characterized by the shallow (~100m) cold air drainage down the slope as the northeasterlies, and above the flow, easterlies or westerlies blow parallel to the mountains. Generally, the wind is not strong except southwesterlies in the daytime. The vertical profile of the mean wind speed at this site is unique for its stratified structure. The wind is very weak in the surface boundary layer any time in a day. Above the layer, the wind speed increases rapidly with height up to 50m. Above 50m, the wind speed is almost constant regardless of height, suggesting the air is well mixed by convection transporting the momentum vertically. This typical structure of wind speed well corresponds to the temperature profile.

On the other hand, in the light of the comparison between the statistics and profiles of wind based on the existing data at Mehrabad and the field survey data at Aghdasiyeh, the considerable differences are recognized in the wind system at the surface level and in the upper layer depending on the observation site. As mentioned above, wind at Aghdasiyeh is distinguished by its diurnal change of local circulation which is supposed to be the so-called 'mountain and valley wind'. While at Mehrabad, westerly is prevailing at the surface level and the upper layer in all seasons except summer when the southeasterlies are dominant in the upper air. The fact shows the wind system in this region is different from place to place and has local characteristics.

② The surface inversion layer appears every night during the upper air observation. The inversion does not develop upward but becomes intense because of radiation cooling. The depth of the inversion is suppressed below 100m, and in some cases, the inversion intensity (the temperature difference between the top and bottom of the layer) exceeds 5℃. In the upper air, inversion layer tends to correspond to the layer where the wind direction changes.

③ The depth of the thermal mixing layer in the daytime is estimated at around 1000 ~ 1500m. When the southwesterlies prevail deep in the upper layer, the vertical temperature gradient is almost constant through the layer in question(surface~2000m) and agrees with the dry adiabatic lapse rate, suggesting that the thermal mixing layer develops in the air higher than 2000m.

④ The statistics of the atmospheric stability at the surface level show that the classes of "strongly stable" in the night-time and "strongly unstable" in the daytime are dominant. These facts and the vertical temperature gradient, which is equivalent to the dry adiabatic lapse rate in the daytime, are consistent with the thermal convection, which develops in the daytime and is suppressed in the nighttime.

4.2 Quality of ambient air

4.2.1 Existing data analysis

Existing data of air quality was obtained from AQCC, MOH and MOO(RIPI). Among them, only the AQCC data are available for the statistical analysis, because other data series are incomplete. The AQCC monitoring stations (Bazar and Fatemi) are located in the center of the city. Bazar is a commercial area, which is a flourish, energetic and crowded town. Usually, the streets are congested with traffics. On the other hand, the monitoring station at Fatemi is set up near the major intersection where the traffic is heavy but flowing smoothly. There are many buildings along the streets but the surrounding area is more open than Bazar.

The statistics of the pollutant concentration at each monitoring station are summarized as follows, based on the data obtained through the measurement for one year (from October 1995 to September 1996).

(1) Annual average concentration of pollutants

The annual average concentrations of SO_2, NO_2, NO, NOx, CO, O_3, THC, and PM10 for the period from October 1995 to September 1996 at Bazar and Fatemi, as well as national environmental standards of some countries and WHO for comparison, are summarized on the table below.

Table 4.2.1-1 Annual average concentration of pollutants and environmental standards

	SO_2	NO	NO_2	NOx	CO	O_3	THC	PM10
Bazar	63.4	61.3	49.9	110.5	7.9	24.8	4.4	123.2
Fatemi	35.4	141.5	43.2	185.2	9.8	14.2	4.9	101.9
WHO standard	17 – 26	—	—	—	—	—	—	60 – 90
U.S.A. standard	35	—	60	—	—	—	—	50/50
Germany standard	57	—	60	—	—	—	—	100
Japan standard	(20)	—	(20~30)	—	—	—	—	(50)

notes;

1) unit : SO_2, NO, NO_2, NOx, O_3 : ppb (The original concentrations in $\mu g/m^3$ are converted into the value in ppb under the condition of Tehran (20℃, 880hPa))

CO, THC : ppm

PM10 : $\mu g/m^3$

2) For the U.S.A. federal standard, the figure before the slash is the first standard and that following the slash is the second standard. The first standard is for protecting citizen's health. The second standard is for protecting citizen's public welfare (fauna, flora, properties etc.).

3) The Japan standard in PM10 column is for SPM (suspended particulate matter). Both PM10 and SPM designate the particles in the air, of which diameter is less than 10 μm. However, the exclusion method of the large particles (>10 μm) is different. As a result of that difference, PM10 includes some particles somewhat larger than 10 μm but SPM never does.

4) Japan does not establish the annual standard. The figures in the table are provided only for reference.

The annual average of pollutant concentration at these stations shows that the concentrations of pollutants considered to originate mainly in mobile sources (NO, CO, THC) are larger at Fatemi, while those of SO_2, O_3 and PM10 are larger at Bazar.

The SO_2 concentration at Fatemi is 35.4 ppb that exceeds the U.S.A. standard and also 1.4 times as large as the WHO and Japan standards. The air sampled at Bazar is

polluted by SO_2 more seriously. The value of 63.4 ppb is over the Germany standards, and twice of the U.S.A. and three times of WHO and Japan standards. The NO_2 concentrations at both stations are less than the standard of the U.S.A. and Germany standards, and twice of Japan. Also, the concentrations of PM10 at these stations are much higher than any standard. These facts show that air pollution in Tehran is considerably serious under the present circumstances.

(2) Monthly average concentration of pollutants

The variations of the monthly average concentrations of SO_2, NO_2, NO, NOx, CO, O_3, THC, and PM10 from October 1995 to September 1996 at Bazar and Fatemi are shown in Fig.4.2.1-1(1) – (2).

① SO_2

The common feature of the variation of the monthly averages of SO_2 at Bazar and Fatemi is that the concentration is high in winter and reaches the peak in December (69.8 ppb at Fatemi, 101.2 ppb at Bazar), and that it falls to the minimum in March (14.8 ppb at Fatemi, 38.2 ppb at Bazar). And, notably, the variations at Bazar and Fatemi have the second peak in April and in July, respectively. The concentrations at Bazar are higher than those at Fatemi through the year. At Bazar, the concentration in each month of December, January and July exceeds 80ppb.

② NO

The common feature of the variation of monthly averages of NO at Bazar and Fatemi is that the concentration is relatively high in autumn and winter and low in spring and summer. The peak is reached in September (215.2 ppb) and December (203.8 ppb) at Fatemi, in September (93.8 ppb) and November (102.1 ppb) at Bazar. The concentrations at Fatemi are considerably higher than those at Bazar through the year. Concerning each month, the value at Fatemi is almost twice as high as the value at Bazar.

③ NO_2

The common feature of the variation of the monthly averages of NO_2 at Bazar and Fatemi is that the concentration is relatively high in winter and low in early summer, but that the annual range is narrow compared with NO. The concentration varies in the range of 25 - 70 ppb at Fatemi and 40 - 65 ppb at Bazar. There is no particular difference between these stations except the concentration at Fatemi has the second peak in April.

④ CO

The concentration at both stations is almost constant through the year, but is slightly higher in summer. Values over 10 ppm is observed in August at Bazar, and in July - November at Fatemi. There is no particular difference between these stations.

⑤ O_3

The O_3 concentration at Fatemi shows a curve very different from one at Bazar, while the values are considerably lower. Reportedly, the instrument for O_3 measurement at Fatemi had a trouble in the sampling tube and manifold which is the part where the sampling line branches off. The measurement of O_3 is considered to have been disturbed by the deposit of other pollutants on the inside surface of these tubes. O_3 is an active gas that readily reacts with other substances so that the measured concentration might be less than the real value because of the loss as a result of the chemical reaction of O_3. Unfortunately, it is not known when the influence of the deposit on the O_3 measurement exceeded the negligible level. For this reason, hereafter, description and comments on the O_3 concentration will be made only for Bazar.

The concentration at Bazar is high in summer and low in winter, and reaches the maximum in July (39.5 ppb). The concentration rises abruptly in May and remains high until August (more than 30 ppb). It is inferred that photochemical reaction is the cause of the high O_3 concentration in summer.

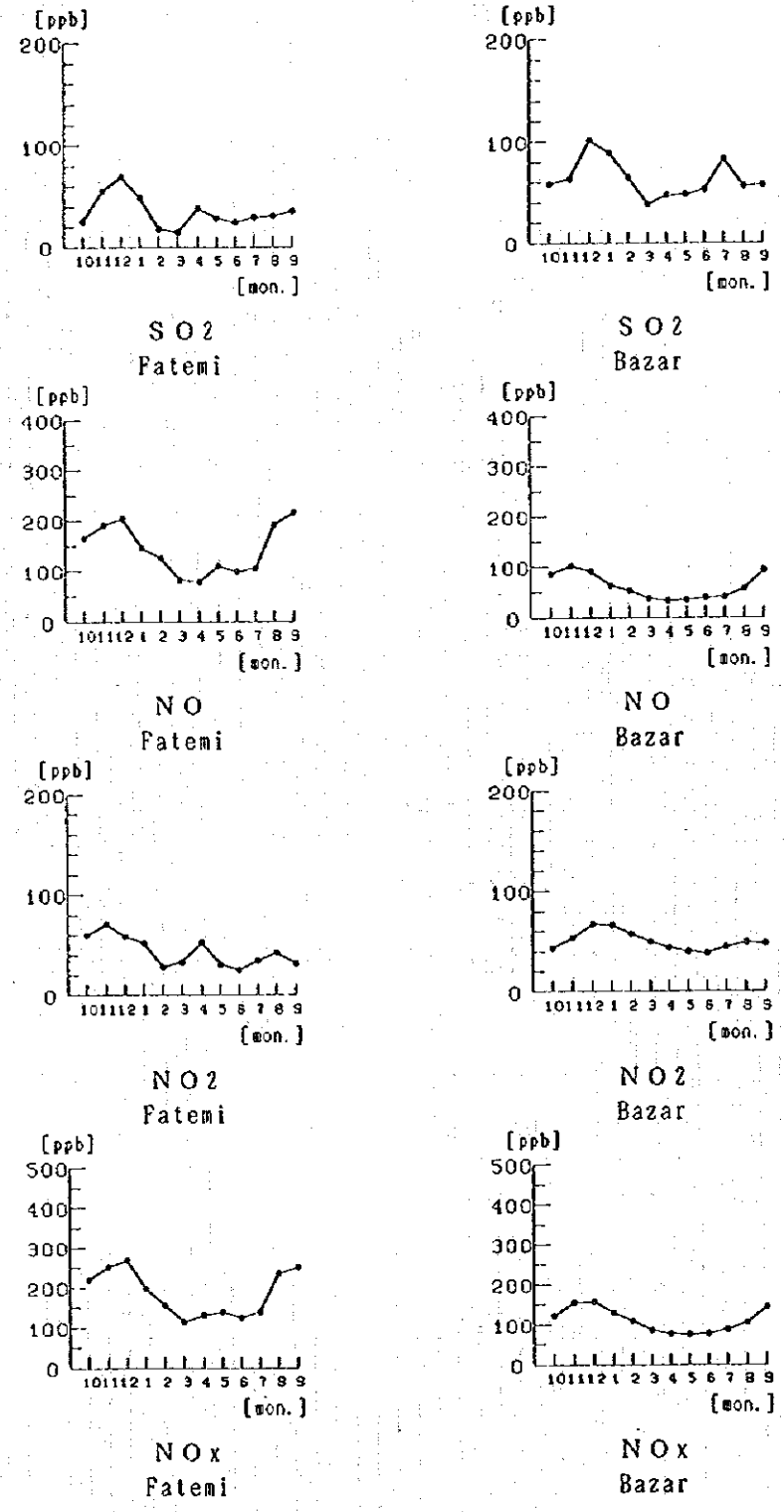


Fig.4.2.1-1(1) The monthly variations of average pollutant concentrations at Bazar and Fatemi (October, 1995 ~ September, 1996).

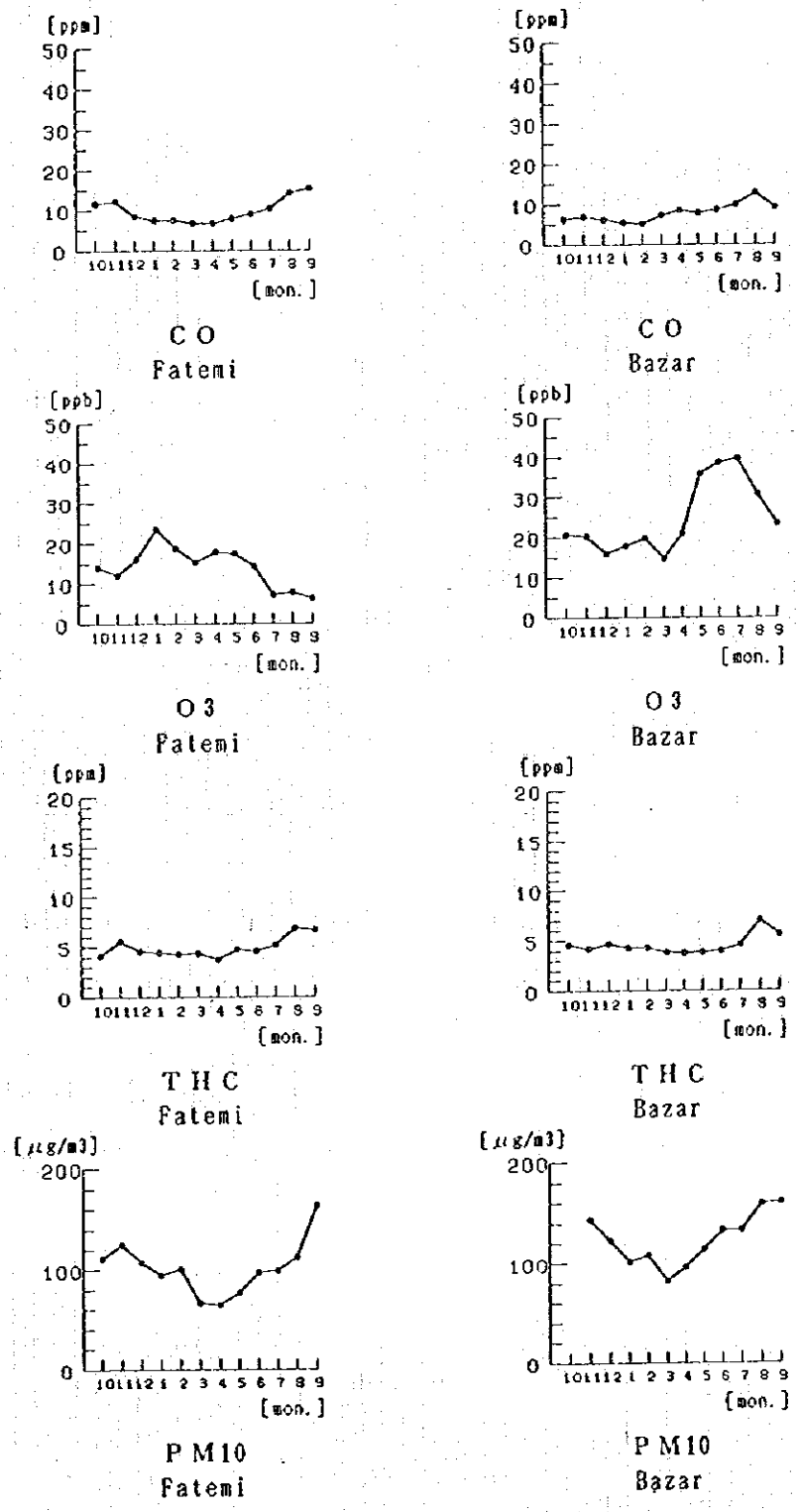


Fig.4.2.1-1(2) The monthly variations of average pollutant concentrations at Bazar and Fatemi (October, 1995 ~ September, 1996).

⑥ THC (Total hydrocarbon)

The concentrations at Bazar and Fatemi vary similarly and are almost constant (4 - 5 ppm) through the year except in late summer when the concentration is a little higher (around 7 ppm).

⑦ PM10

The common feature of the monthly averages of PM10 at Bazar and Fatemi is that the concentration is high in autumn and low in spring. The maximum value is observed in September at both stations (over 160 $\mu g/m^3$), and the minimum in March (82.1 $\mu g/m^3$ at Bazar) or in April (64.6 $\mu g/m^3$ at Fatemi). The concentrations at Bazar are higher than those at Fatemi almost through the year and the difference between the stations is large in summer.

Generally speaking, the concentrations of the pollutants except O_3 tend to increase and reach the maximum in cool seasons. The monthly averages of these pollutant concentrations depend on not only conditions of source activities and atmospheric stability but also seasonal changes in the prevailing wind. It is suggested that the cool season has favorable background for high concentration appearance concerning source activities, transportation and diffusion of pollutants.

O_3 shows a high concentration in summer. Apparently variation of the O_3 concentration highly depends on the strength of the sunshine rather than atmospheric conditions.

(3) Diurnal variations of pollutant concentration

Diurnal variations of the concentration of pollutants (SO_2, NO_2, NO, CO, O_3, THC and PM10) at Bazar and Fatemi in terms of monthly averages for every hour are shown in Fig.4.3.1-2(1) – (2). All the months are grouped into the 4 seasons [spring (March, April, May), summer (June, July, August), autumn (September, October, November) and winter (December, January, February)]. The diagrams are shown for each season. Attention should be paid to the autumn data, of which the September data are not in

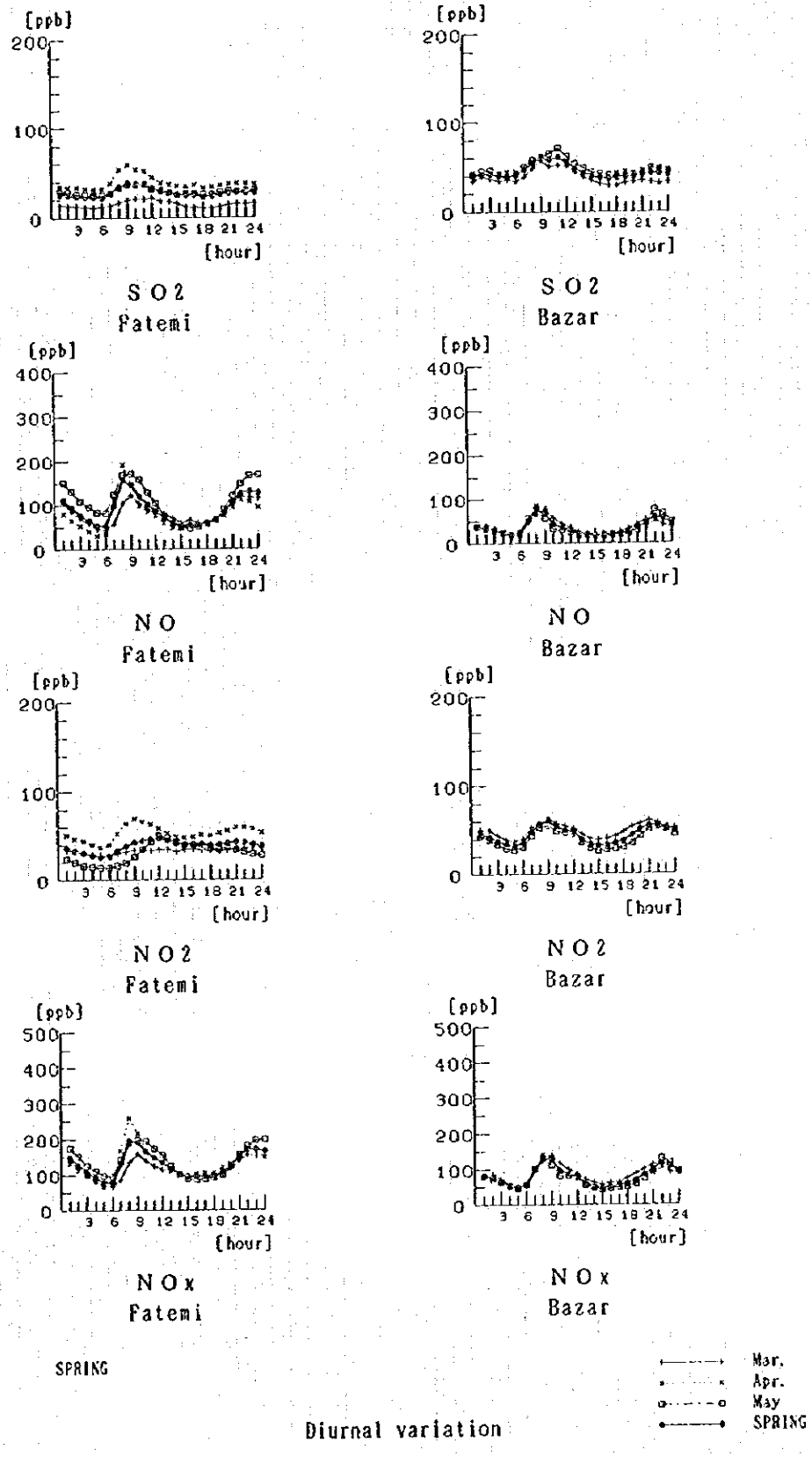


Fig.4.2.1-2(1) The diurnal variations of pollutant concentrations at Bazar and Fatemi based on monthly averages for every hour (October, 1995 ~ September, 1996).

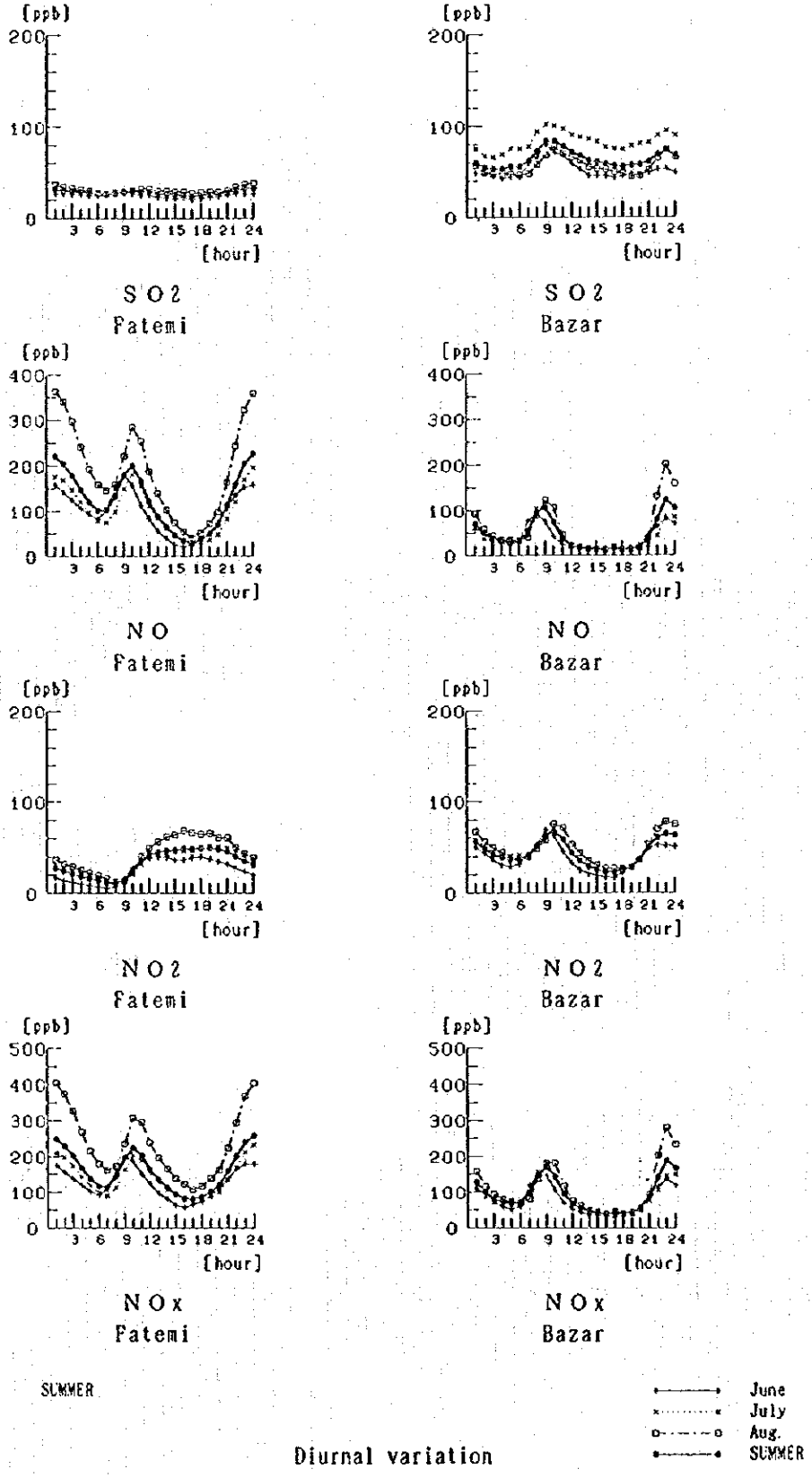


Fig.4.2.1-2(2) The diurnal variations of pollutant concentrations at Bazar and Fatemi based on monthly averages for every hour (October, 1995 ~ September, 1996).

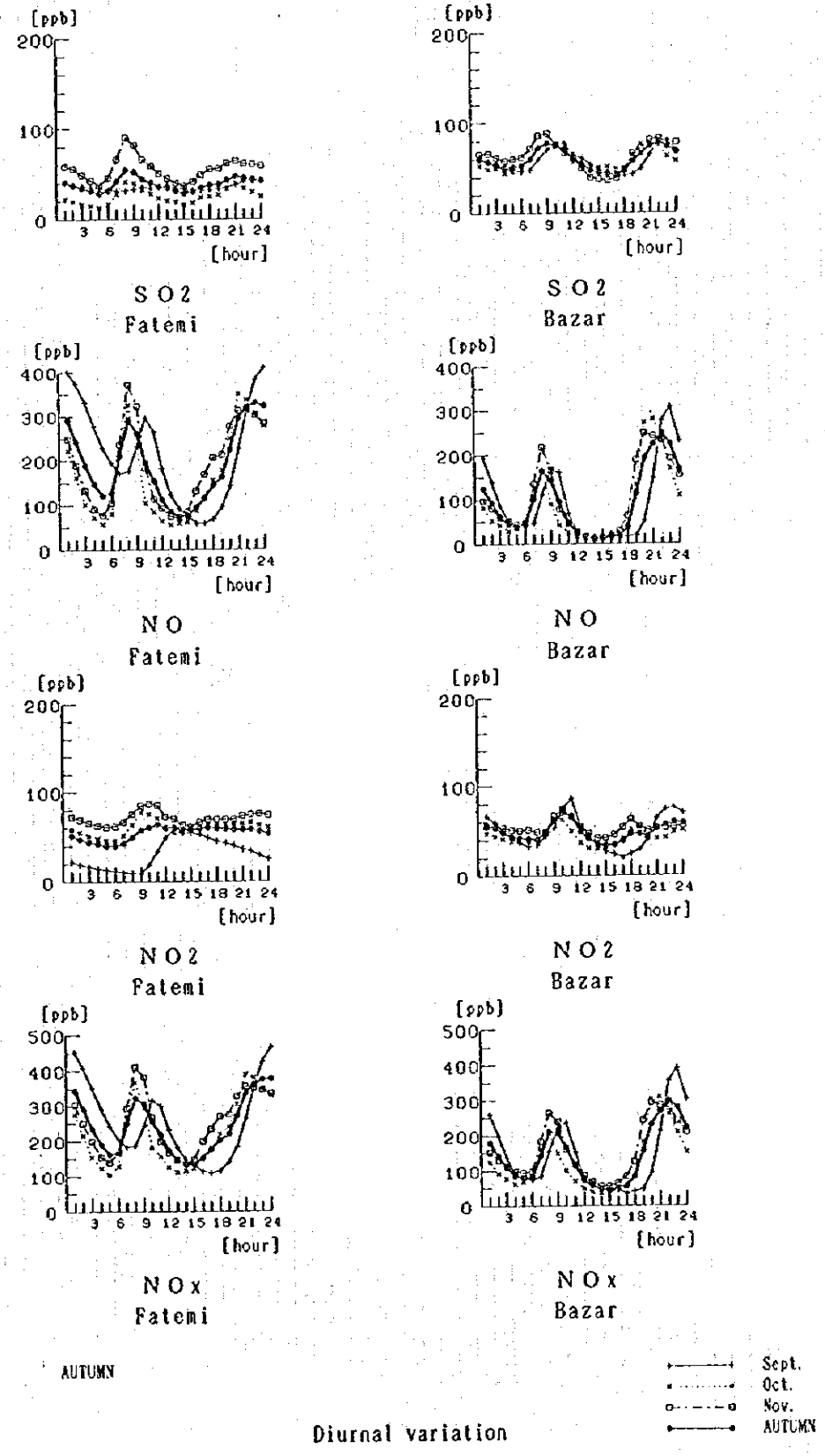


Fig.4.2.1-2(3) The diurnal variations of pollutant concentrations at Bazar and Fatemi based on monthly averages for every hour (October, 1995 ~ September, 1996).

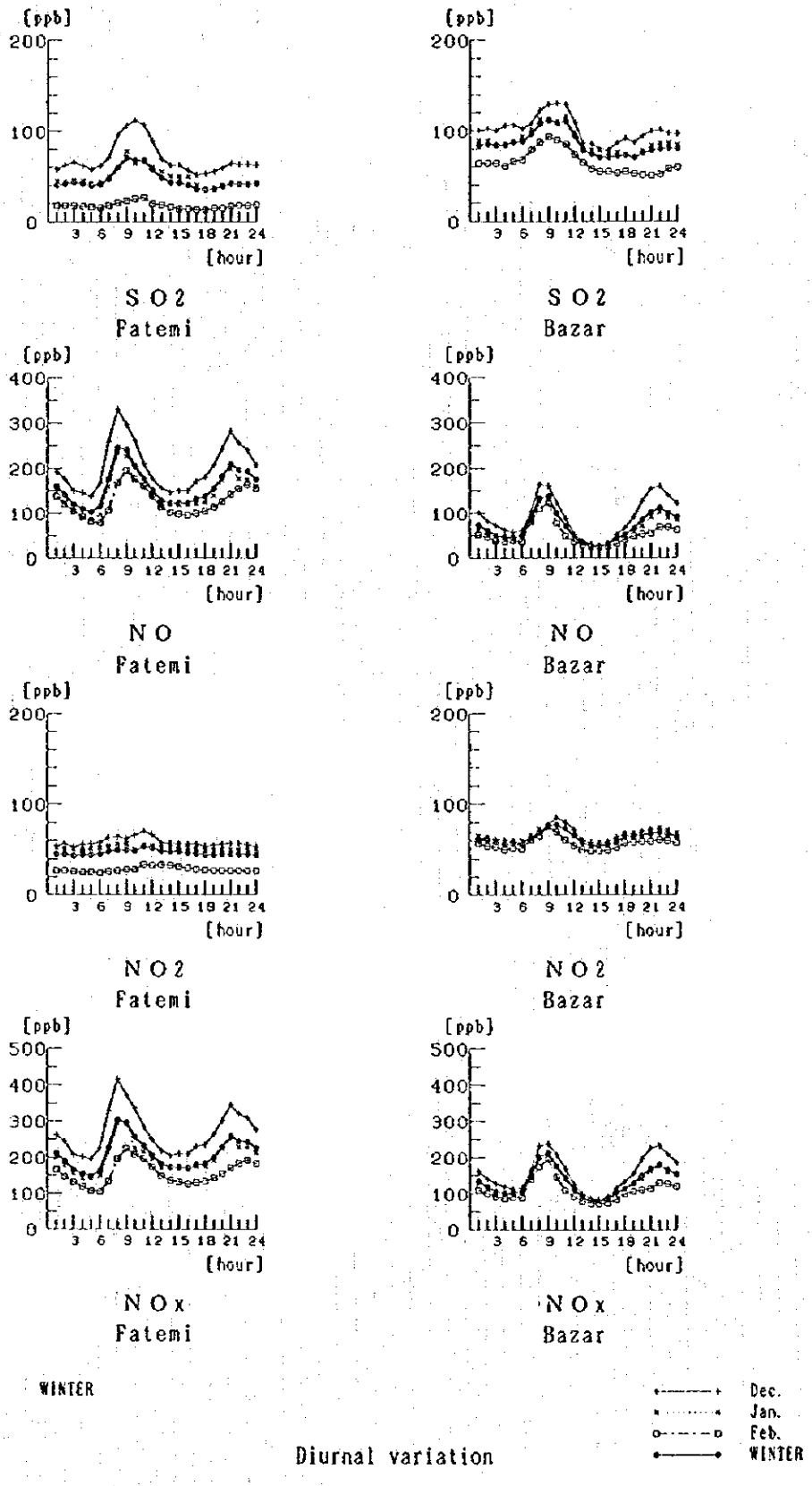


Fig.4.2.1-2(4) The diurnal variations of pollutant concentrations at Bazar and Fatemi based on monthly averages for every hour (October, 1995 ~ September, 1996).

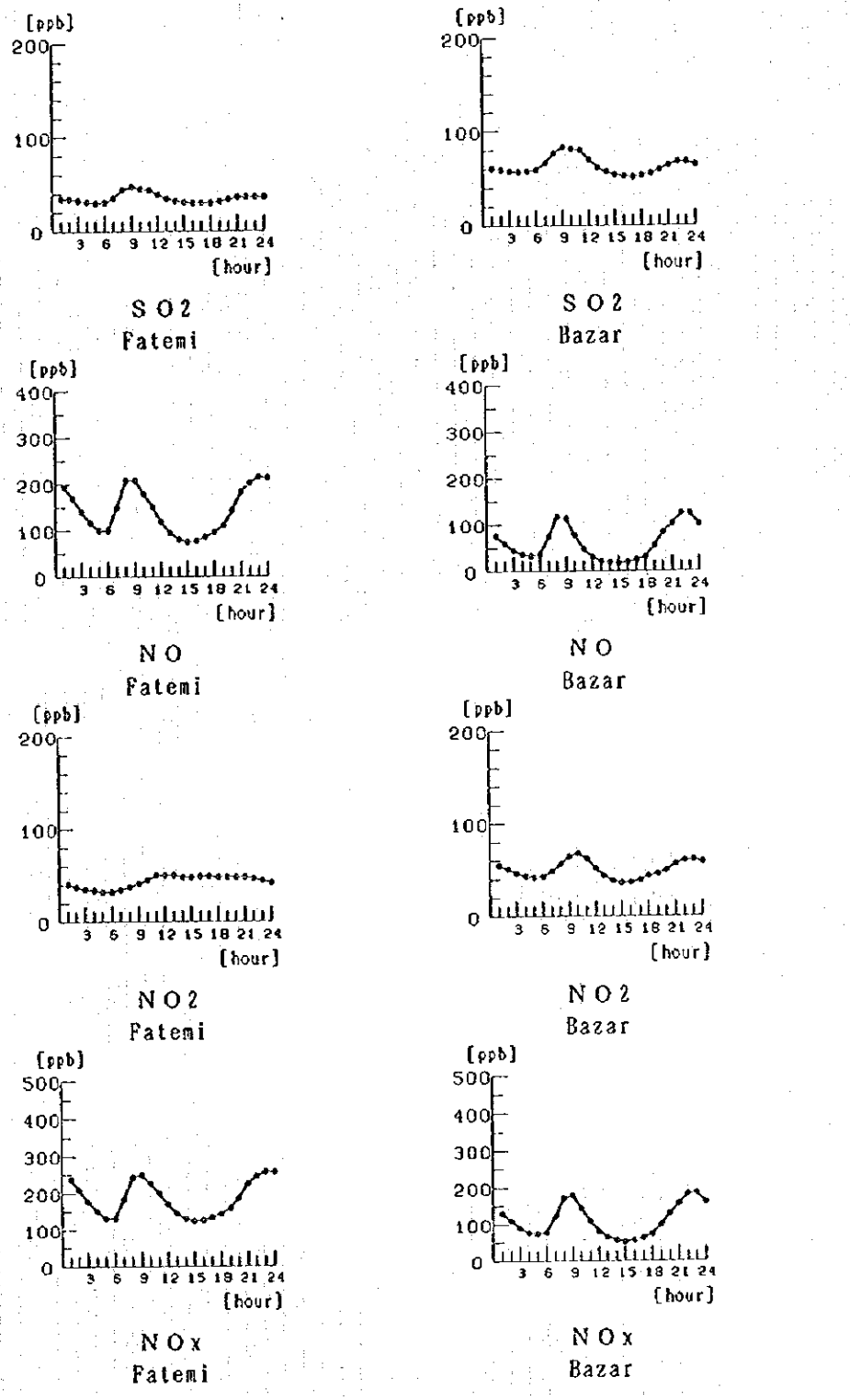


Fig.4.2.1-2(5) The diurnal variations of pollutant concentrations at Bazar and Fatemi based on monthly averages for every hour (October, 1995 ~ September, 1996).

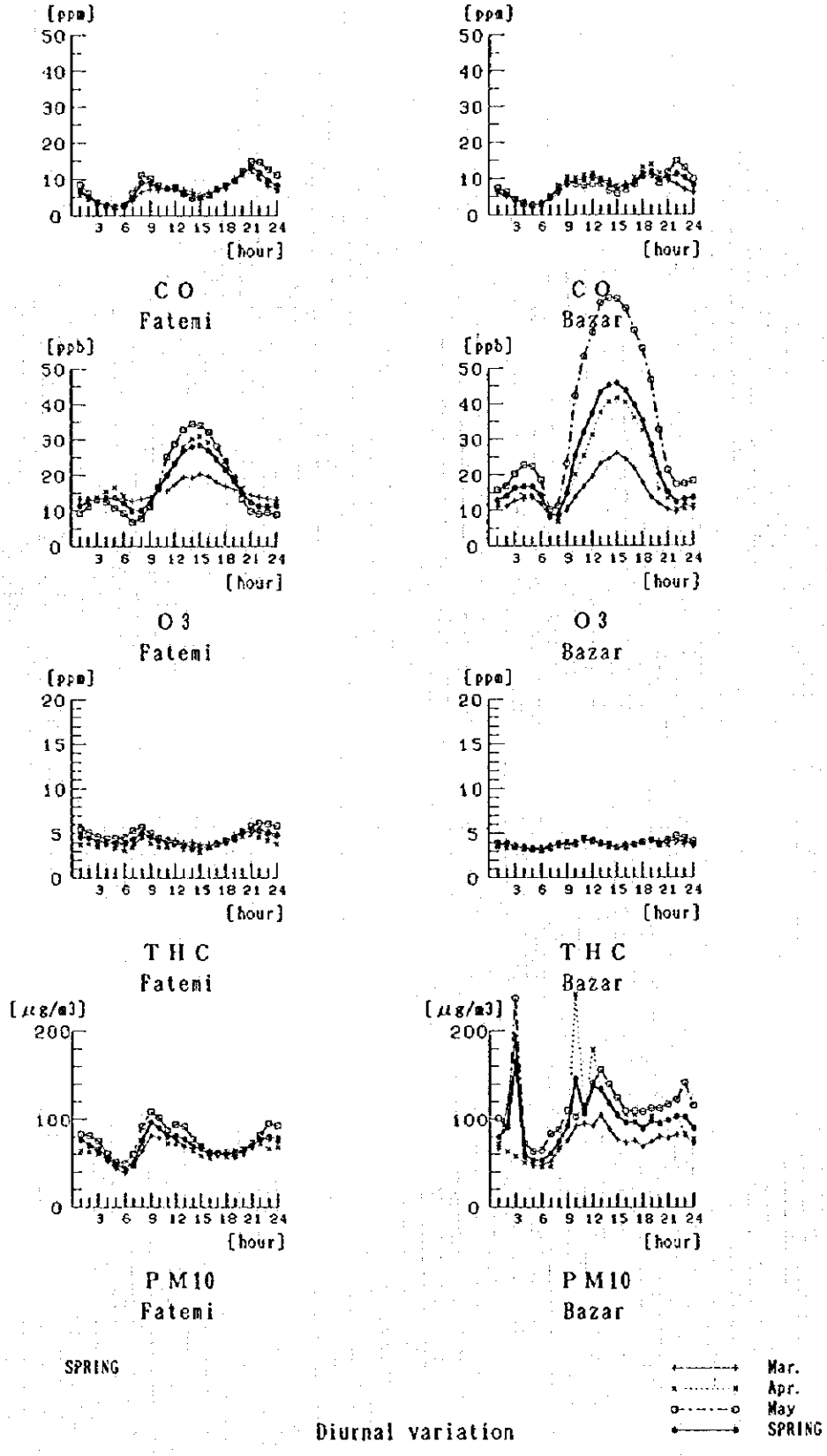


Fig.4.2.1-2(6) The diurnal variations of pollutant concentrations at Bazar and Fatemi based on monthly averages for every hour (October, 1995 ~ September, 1996).

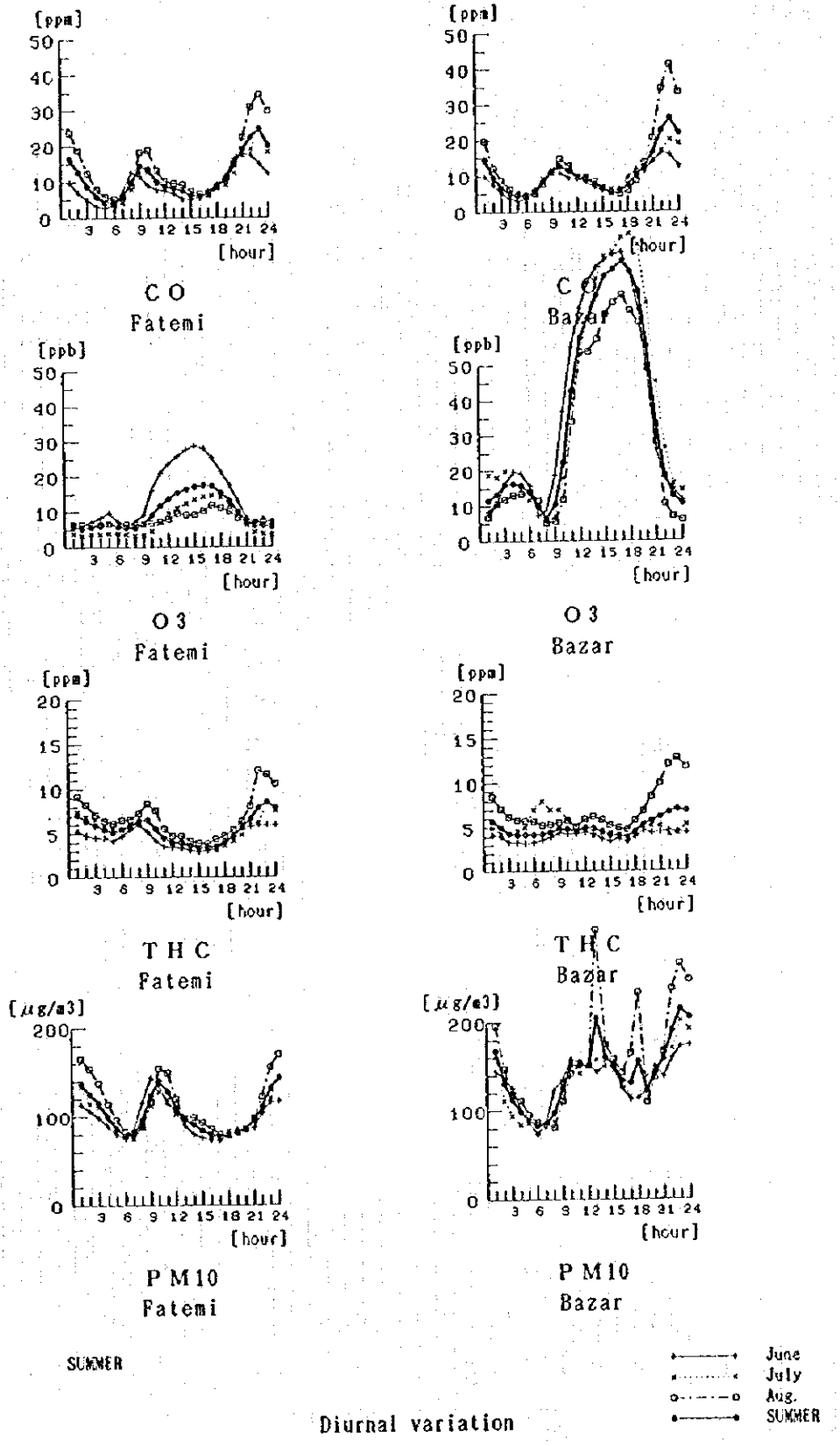


Fig.4.2.1-2(7) The diurnal variations of pollutant concentrations at Bazar and Fatemi based on monthly averages for every hour (October, 1995 ~ September, 1996).

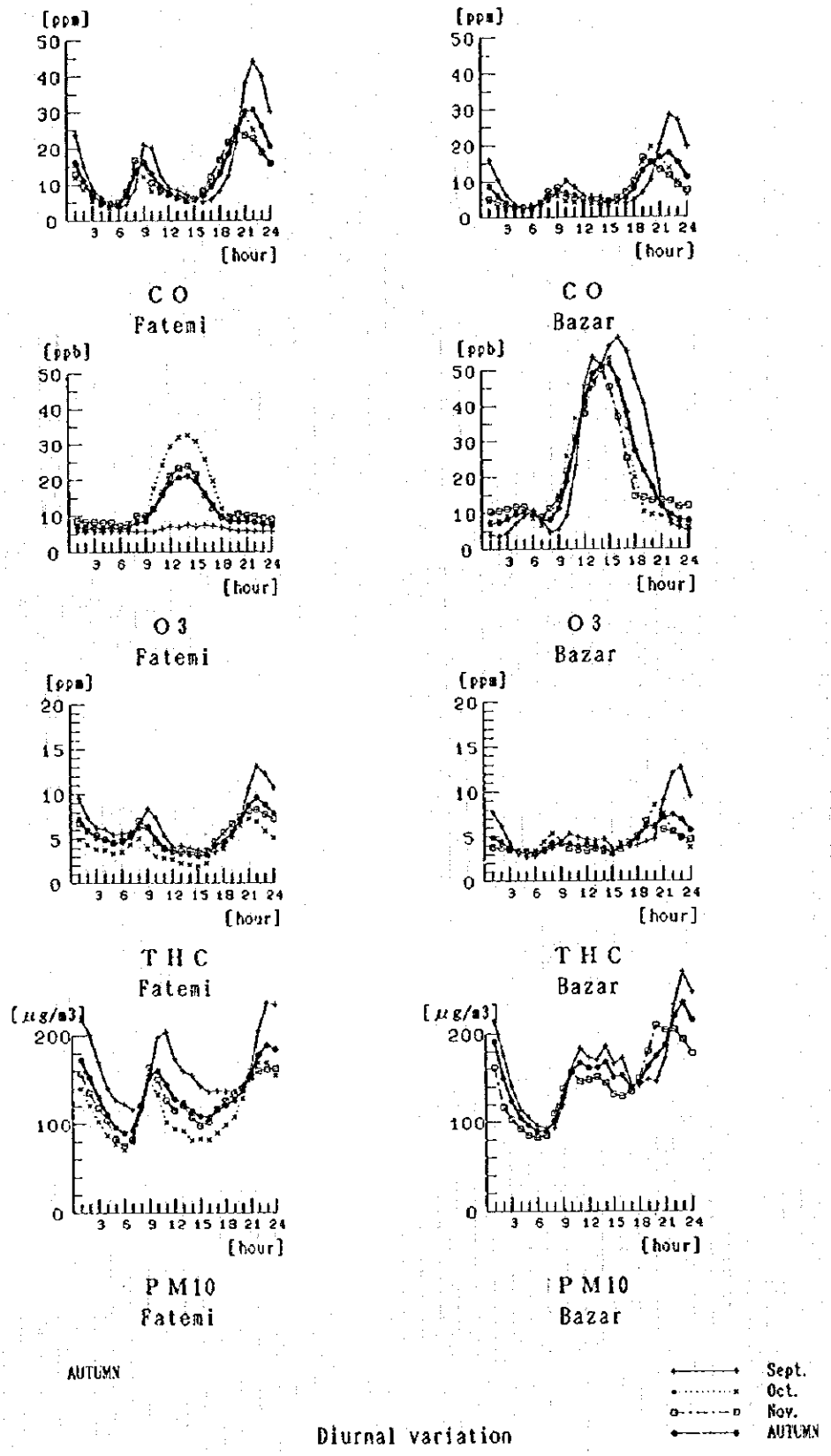


Fig.4.2.1-2(8) The diurnal variations of pollutant concentrations at Bazar and Fatemi based on monthly averages for every hour (October, 1995 ~ September, 1996).

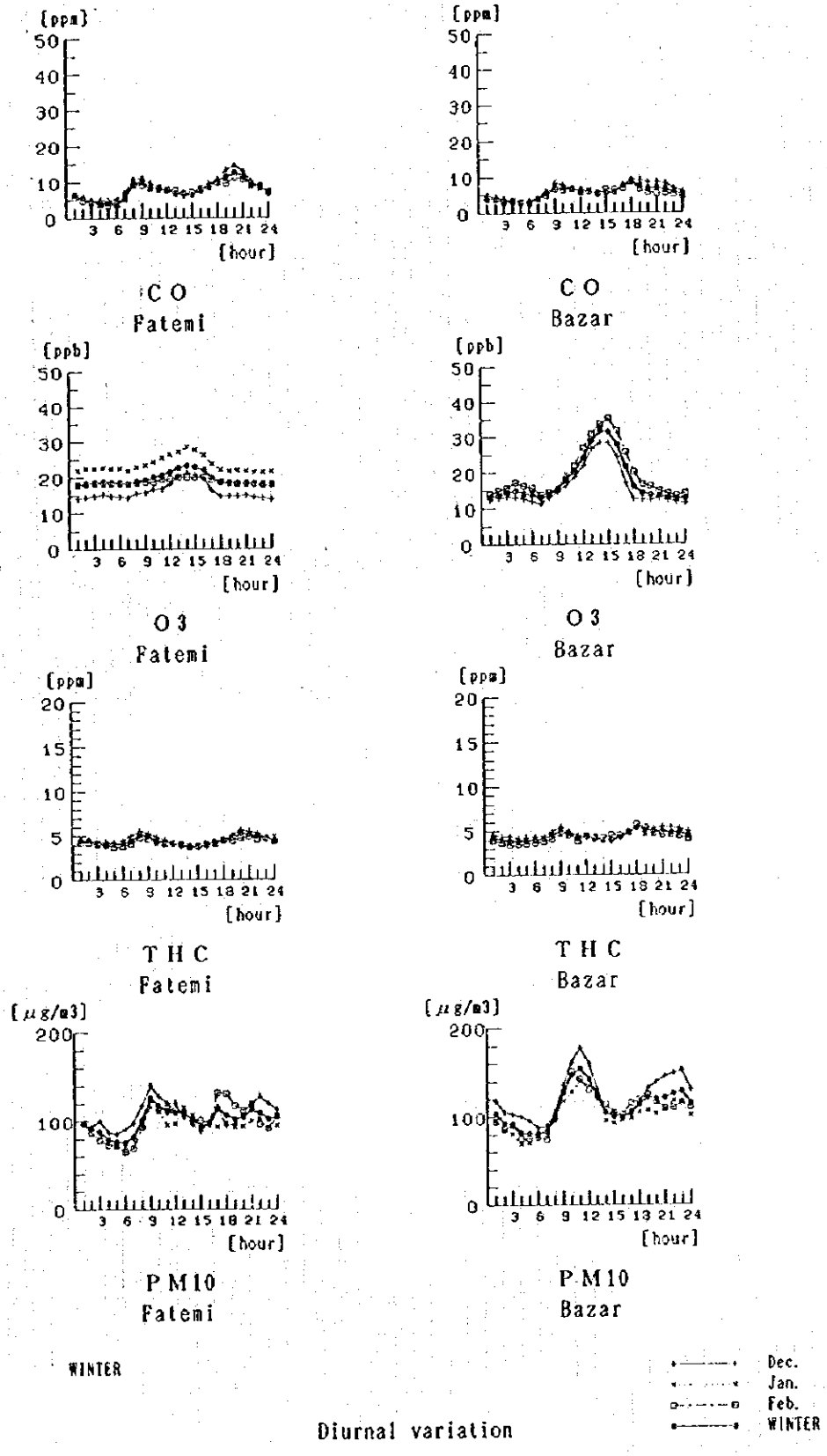


Fig.4.2.1-2(9) The diurnal variations of pollutant concentrations at Bazar and Fatemi based on monthly averages for every hour (October, 1995 ~ September, 1996).

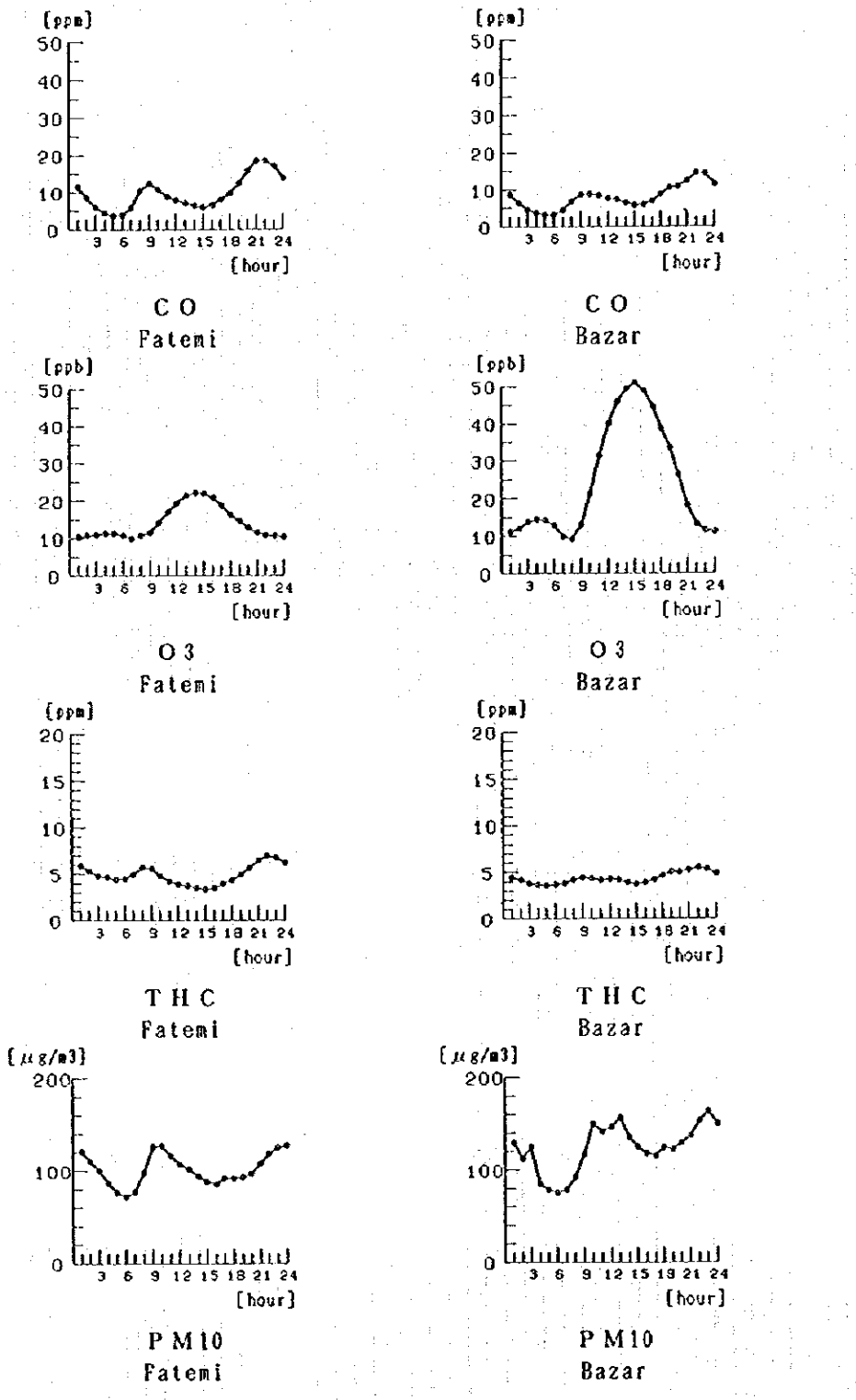


Fig.4.2.1-2(10) The diurnal variations of pollutant concentrations at Bazar and Fatemi based on monthly averages for every hour (October, 1995 ~ September, 1996).

sequence with the following months because the measurement started in October 1995 and ended in September 1996.

① SO_2

a. Bazar

In spring and winter, the seasonal averaged curve is characterized by one peak at around 9:00 in the morning. On the other hand, in summer and autumn, diurnal variation shows the half day periodicity: two peaks are observed at around 9:00 in the morning and 22:00 in the night. The diurnal range is the widest in winter (70 - 110 ppb) and the narrowest in spring (40 - 60 ppb). The month with the highest concentration is December. The December curve maintains a high level concentration with the maximum (about 130 ppb) in the morning and the minimum (about 80 ppb) in the afternoon. On the other hand, spring months stay low below 60 ppb.

b. Fatemi

It is hard to say that the seasonal averaged curves at Fatemi are similar to the curves at Bazar. In spring and summer, the diurnal change is insignificant throughout the day and the concentration remains low below 40 ppb. In autumn and winter, the common characteristic is that the diurnal change shows a distinct peak in the morning. High level concentrations are observed in November and December. The diurnal range is 40 - 90 ppb in November and 50 - 110 ppb in December.

② NO

a. Bazar

The common feature of the diurnal variation in terms of all the seasonal average is the distinct half-day periodicity. These curves are characterized by two sharp peaks appearing at around 9:00 and 22:00. In spring and summer, the concentration is relatively low. The diurnal range is about 20 - 80 ppb in spring and about 10 - 125 ppb in summer. The autumn curve has a significantly wide amplitude. The concentration rises to the first peak (160 ppb) in the morning and falls down to the bottom(about 10 ppb)

in the afternoon, then recovers rapidly and reaches the maximum(250 ppb) in the late evening. The winter curve is moderate compared to the autumn curve, changing in the range of 20 - 140 ppb.

b. Fatemi

The diurnal variation of the seasonal average at Fatemi as well as at Bazar shows two peaks in a day. The peak value of concentration appears almost simultaneously with Bazar, but the peak values and diurnal range are much larger. In spring and winter, the feature of the diurnal change is similar but is amplified in comparison with the change at Bazar. In summer and autumn, such features mentioned above are the same, except the concentrations fluctuate violently. Especially, the monthly averaged curves of August, September and November have the maximum over 350 ppb. Among them, the September curve deserves attention because of its maximum over 400 ppb and a 2 hour phase shift in diurnal variation in comparison with the other months.

③ NO_2

a. Bazar

In spring and summer, the peak of the seasonal averaged diurnal change is observed in the cycle of a half-day, in the morning and in the late evening. Compared to NO, the diurnal range is narrow, 30 - 60 ppb in spring and 20 - 65 ppb in summer. In autumn and winter, the peak in the morning remains distinct, but the second peak in the late evening is hardly recognized. The diurnal range is 30 - 70 ppb in autumn and 55 - 80 ppb in winter.

b. Fatemi

It is difficult to find the common features of the diurnal changes of the seasonal averages at Bazar and Fatemi. Furthermore, the difference in the shape of concentration curve among the months is notably bigger than the curves at Bazar. In winter, the diurnal curve is almost flat around 50 ppb. In the other seasons, the minimum is observed in the early morning and the curve gets flat in the afternoon. The

diurnal range is 25 - 50 ppb in spring, 10 - 50 ppb in summer and 40 - 60 ppb in autumn.

④ CO

a. Bazar

In spring and winter, the seasonal averaged concentration varies in a small range and remains low, 3 - 12 ppm in spring and 3 - 9 ppm in winter. In summer and autumn, the curves have two peaks in the morning and in the late evening as the curves of SO_2, NO and NO_2 do, and the maximum is reached at 22:00 - 23:00. The diurnal range is 4 - 25 ppm in summer and 3 - 18 ppm in autumn.

b. Fatemi

The diurnal change of each seasonal averaged concentration throughout the year except autumn is similar to the corresponding curves at Bazar. In autumn, the variation is similar to that of Bazar, but the amplitude is rather greater.

⑤ O_3

a. Bazar

Unlike other pollutants, diurnal changes of the seasonal averaged O_3 in all the seasons have one outstanding peak at around 14:00 - 15:00, but at 16:00 - 17:00 in summer. Common to all the seasons, O_3 increases suddenly after around 9:00 until it reaches its maximum in the afternoon, and drops down in the evening. Seasonal difference of the minimum concentration is insignificant (around 10 ppb). On the other hand, the maximum value changes considerably depending on the season; that is, summer has the extremely high level maximum concentration (about 80 ppb) but the winter maximum has only less than half of that (about 30 ppb). Photochemical reactions in the daytime is supposed to be a cause of these diurnal variations.

b. Fatemi

The pattern of diurnal variation at Fatemi in each season is similar to the corresponding one at Bazar, while the minimum concentration is as high as that of Bazar.

It should be noted, however, that its amplitude is considerably smaller than that of Bazar through the year, while the maximum in summer is as high as the winter minimum. The fact is inconsistent with seasonal changes in the concentration at Bazar.

⑥ THC (Total hydrocarbon)

a. Bazar

Diurnal variation of the seasonal average in every season has two peaks in the morning and evening, but some of them are not recognized easily. The concentration in spring and winter varies in a comparatively small range, 4 - 6 ppm. On the other hand, in summer and autumn the second peak is relatively high (7 - 8 ppm), so that the diurnal range is somewhat greater. Concerning the monthly averages, the August concentration at night is extremely high.

b. Fatemi

The variation pattern in every season is almost the same with Bazar, except that the variations in summer and autumn are characterized by the morning peak that can be identified more easily and the higher concentration of the night peak.

⑦ PM10

a. Bazar

Diurnal variation of the seasonal average in every season has two peaks, but the peak appearing time varies depending on the season or month. The spring and summer curves seem somewhat random because of the wide swing in April, May and August. The peak value exceeding 200 $\mu g/m^3$ appears in the night of summer and autumn, and peak around 180 $\mu g/m^3$ appears in the morning of winter and spring.

b. Fatemi

The pattern of the diurnal variation in each season is similar to that of Bazar. The concentration, however, is lower as a whole and the curves are smoother.

In the diurnal variations based on the annual averages, the characteristics common to all pollutants but O_3 are that they have two peaks a day, at around 9:00 in the morning and 22:00 in the late evening. Especially, the concentrations of NO, CO and PM10 are clearly periodical. At both stations, the daily maximum value is twice as large as the minimum. Compared to Bazar, diurnal change of these pollutants at Fatemi has complete cycles, and has distinct two peaks, a wider diurnal range and a higher concentration. These pollutants are considered to originate in traffics. The combination of traffic volume and stability in the surface boundary layer is thought to control the pollutants concentrations. Consequently, two peaks in the morning and in the late evening is thought to be caused by both increased traffic in rush hours, and the stable layer near the surface, providing conditions favorable for stagnation of pollutants.

On the other hand, O_3 has only one conspicuous peak in the afternoon. Photochemical oxidant is produced by photochemical reactions caused by solar ultraviolet irradiating against nitrogen dioxide and hydrocarbon. It therefore suggests that the photochemical reaction brings about the high concentration of O_3 in the afternoon.

(4) The 7-day variation of pollutants concentration

Variations of concentration of pollutants (SO_2, NO_2, NO, CO, O_3, THC and PM10) at Bazar and Fatemi based on the monthly averages for every day of the week are shown in Fig.4.2.1-3(1) – (10). Friday is a holiday, and Thursday is a half-holiday in Iran. Because activities of pollutant sources depend on the day of the week, the pollutant concentration is expected to regularly vary in a week.

① SO_2

The minimum concentration on Friday is recognized only in autumn at both stations. Especially, the November curve shows the evident dropping down of concentration on Friday. On the other hand, there is no particular variation in a week in spring and summer when the curves are almost flat through a week. In winter, the minimum is seen on Wednesday at both stations.

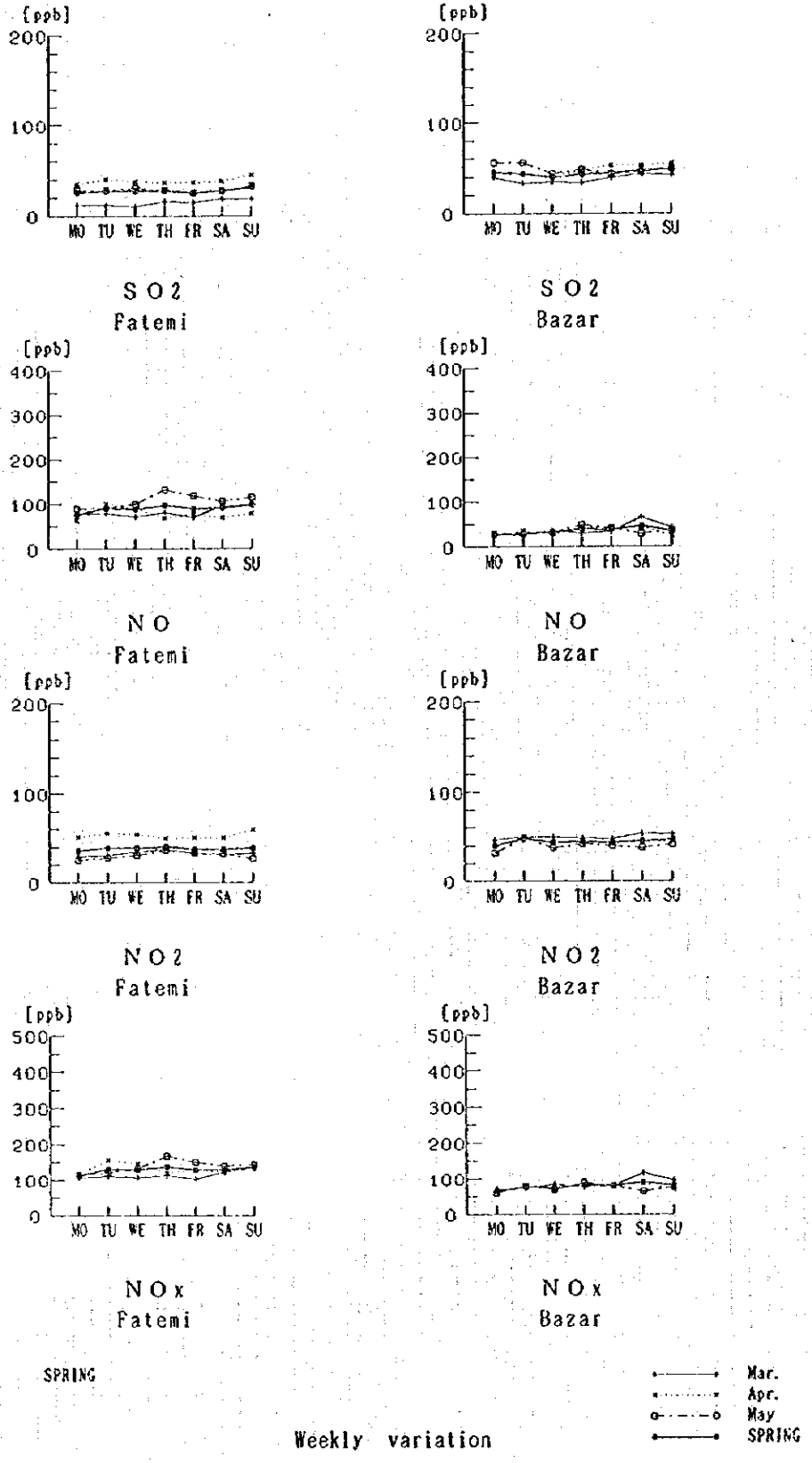


Fig.4.2.1-3(1) The 7-day variations of pollutant concentrations at Bazar and Fatemi based on monthly averages for every day of the week (October, 1995 ~ September, 1996).

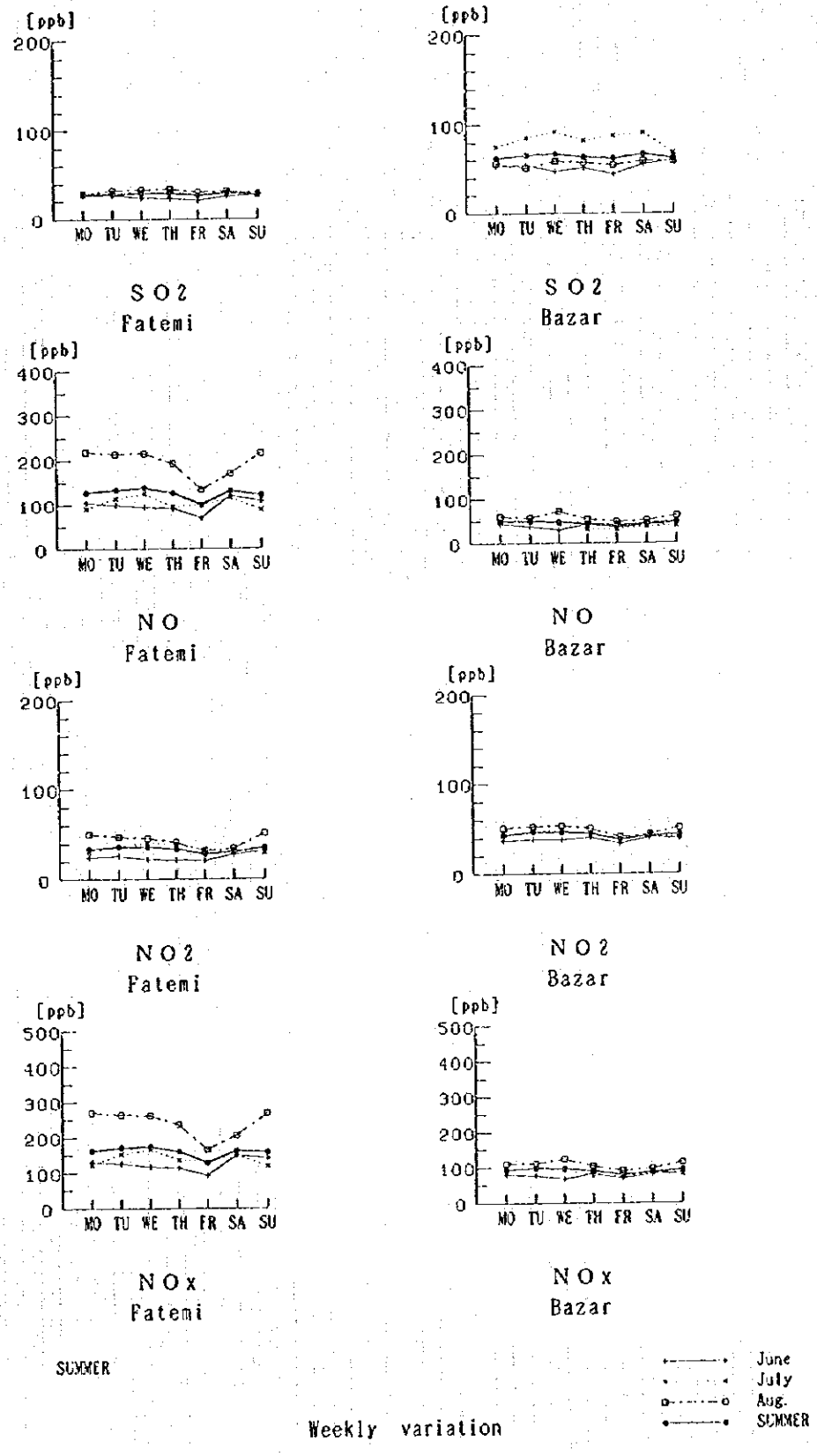


Fig.4.2.1-3(2) The 7-day variations of pollutant concentrations at Bazar and Fatemi based on monthly averages for every day of the week (October, 1995 ~ September, 1996).

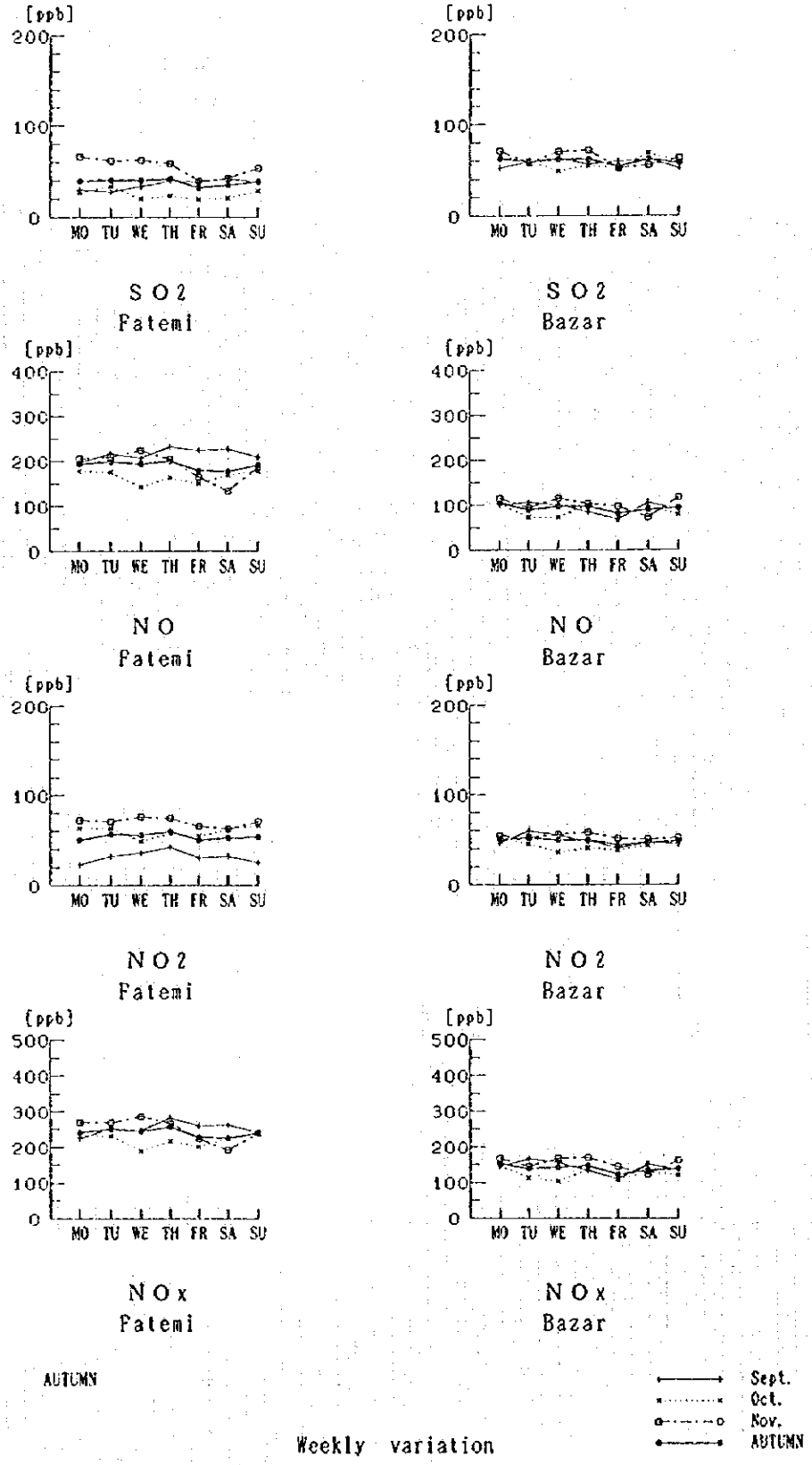


Fig.4.2.1-3(3) The 7-day variations of pollutant concentrations at Bazar and Fatemi based on monthly averages for every day of the week (October, 1995 ~ September, 1996).

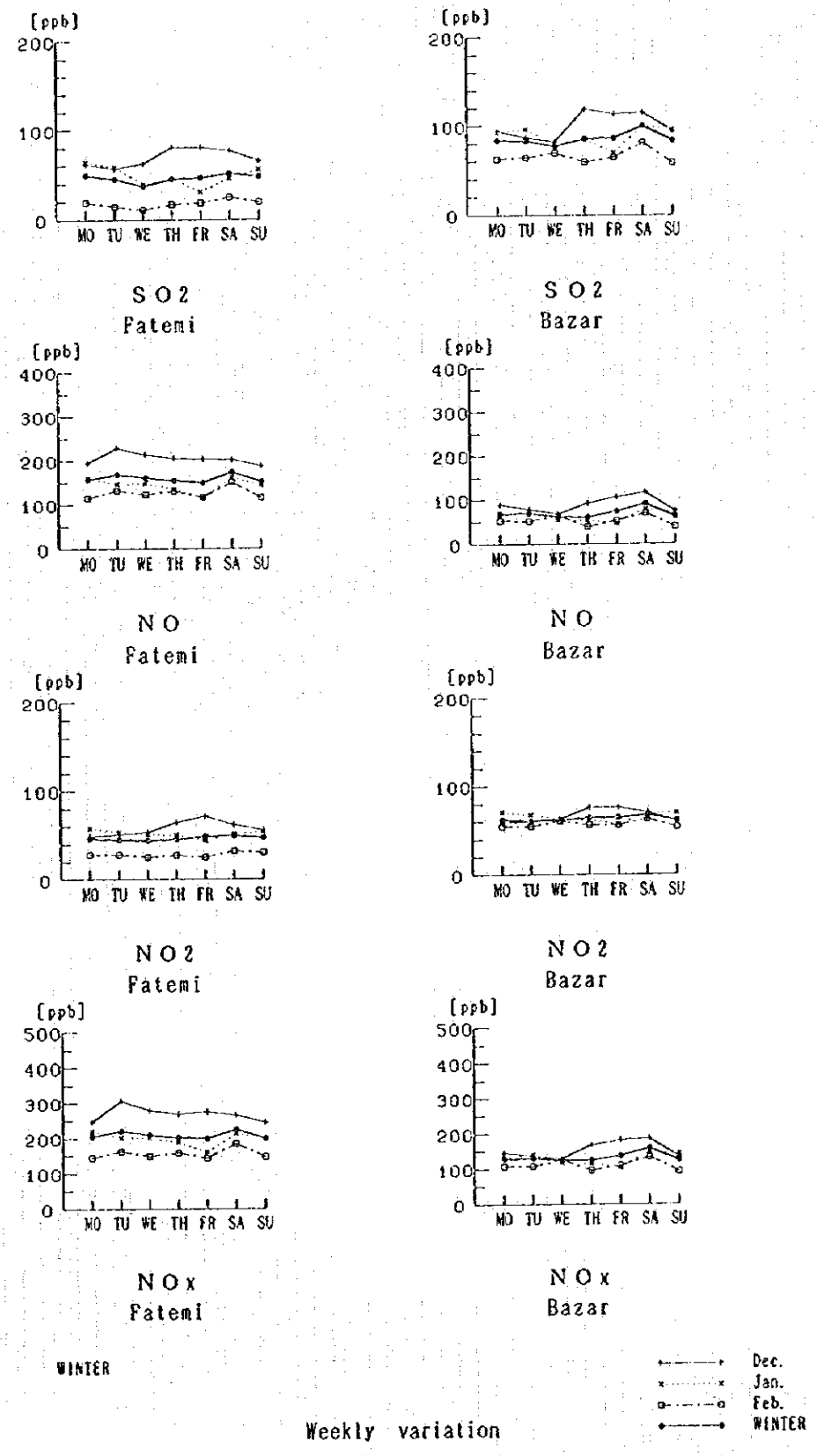


Fig.4.2.1-3(4) The 7-day variations of pollutant concentrations at Bazar and Fatemi based on monthly averages for every day of the week (October, 1995 ~ September, 1996).

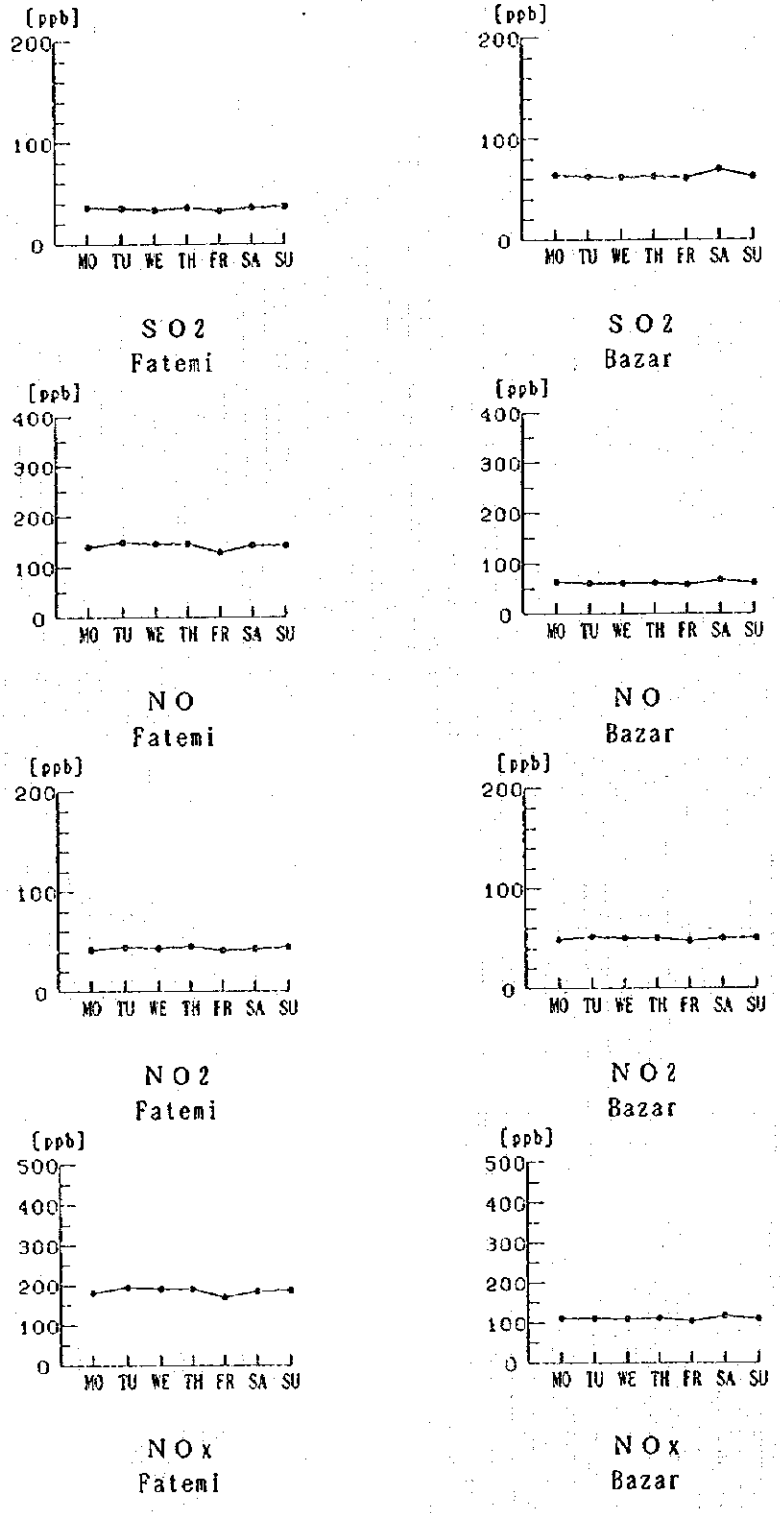


Fig.4.2.1-3(5) The 7-day variations of pollutant concentrations at Bazar and Fatemi based on monthly averages for every day of the week (October, 1995 ~ September, 1996).

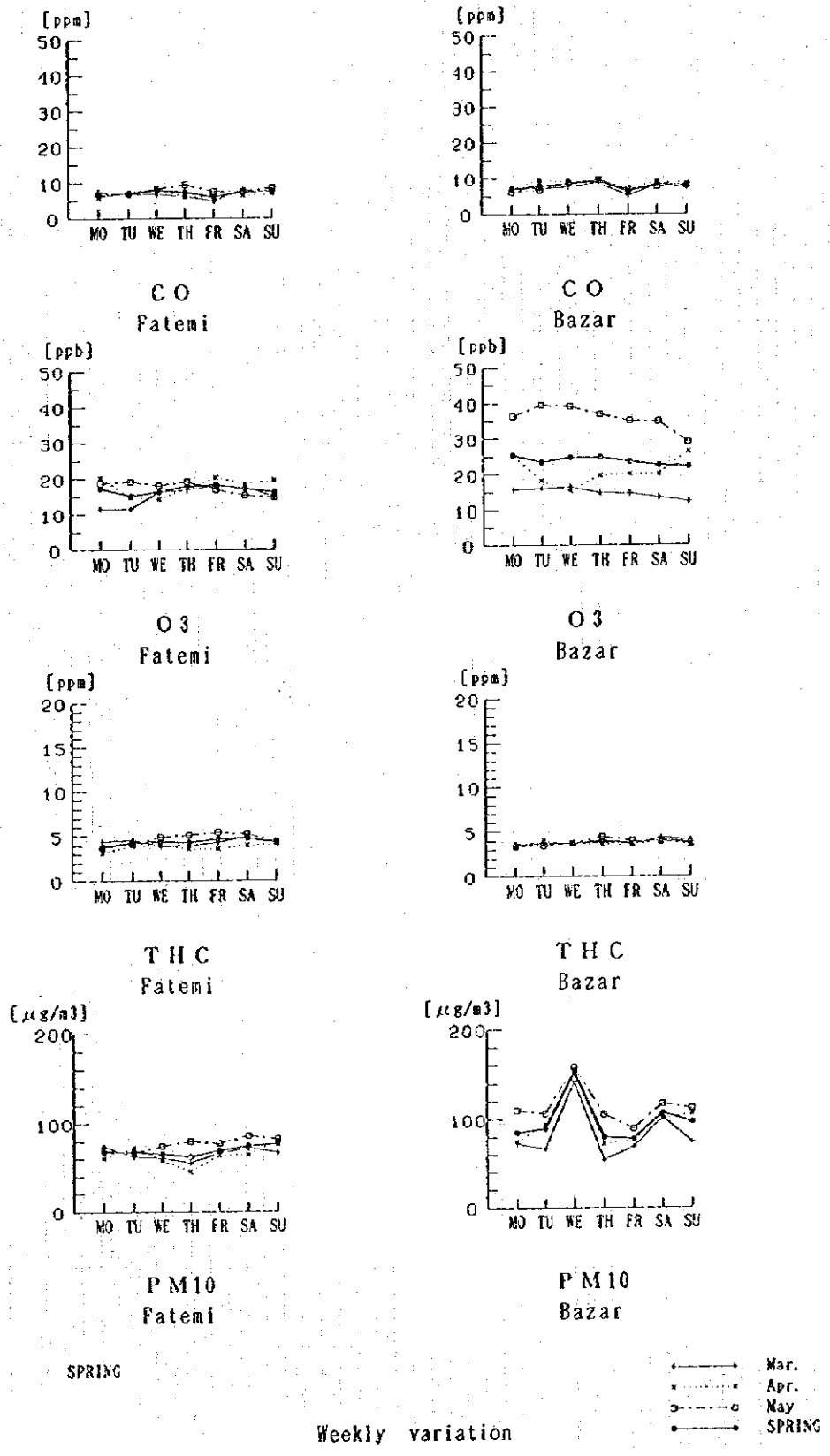


Fig.4.2.1-3(6) The 7-day variations of pollutant concentrations at Bazar and Fatemi based on monthly averages for every day of the week (October, 1995 ~ September, 1996).

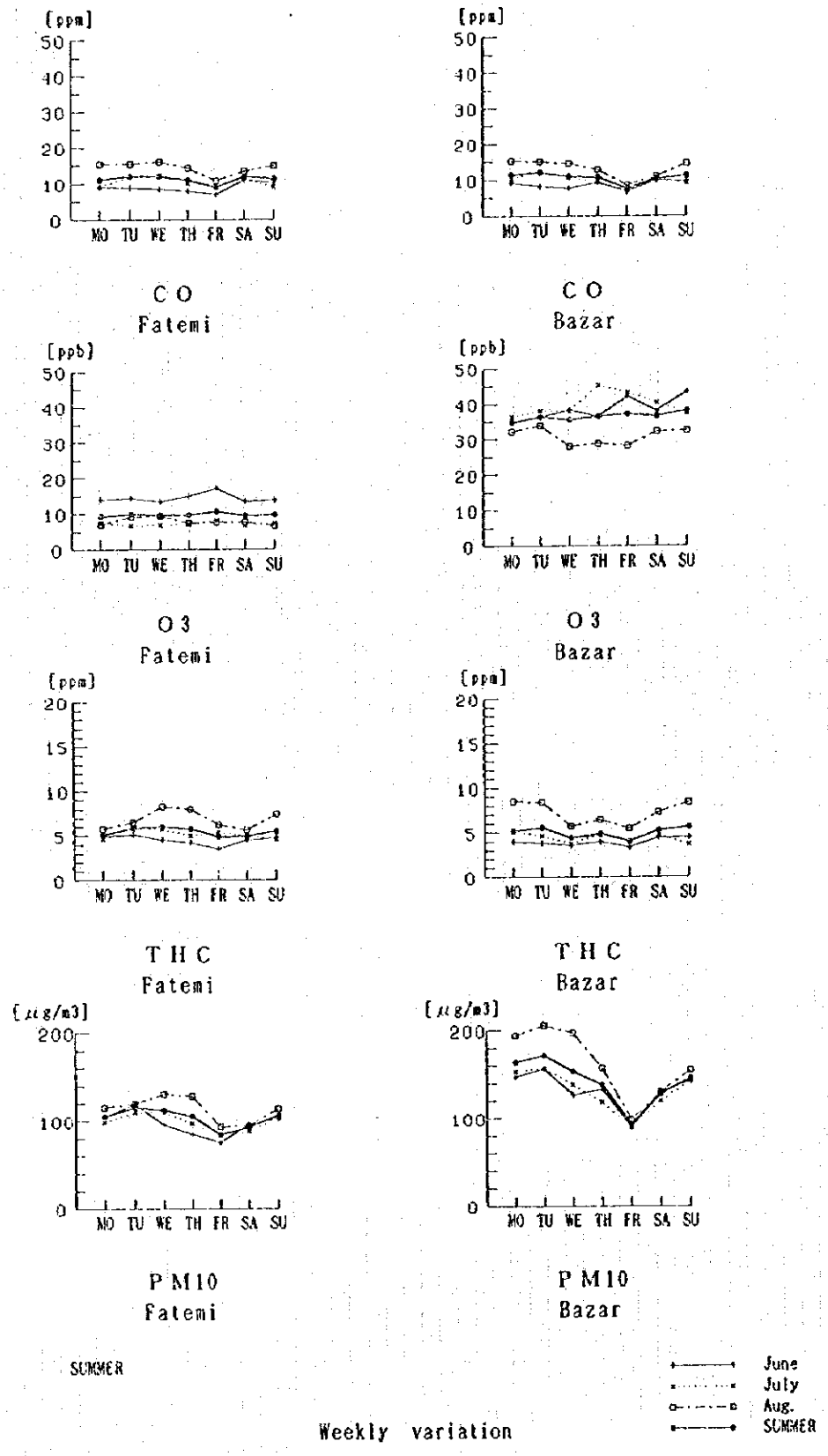


Fig.4.2.1-3(7) The 7-day variations of pollutant concentrations at Bazar and Fatemi based on monthly averages for every day of the week (October, 1995 ~ September, 1996).

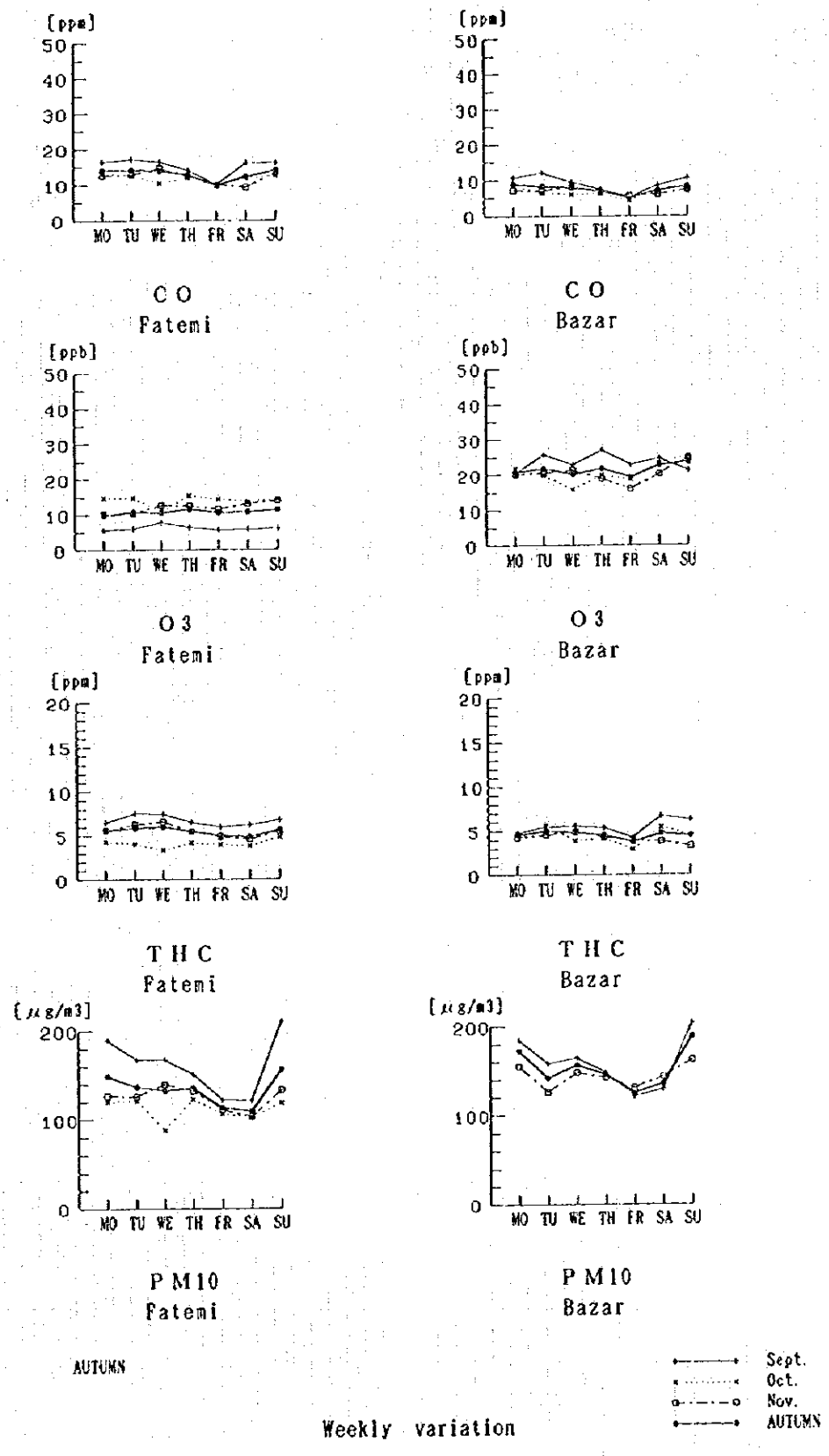


Fig.4.2.1-3(8) The 7-day variations of pollutant concentrations at Bazar and Fatemi based on monthly averages for every day of the week (October, 1995 ~ September, 1996).

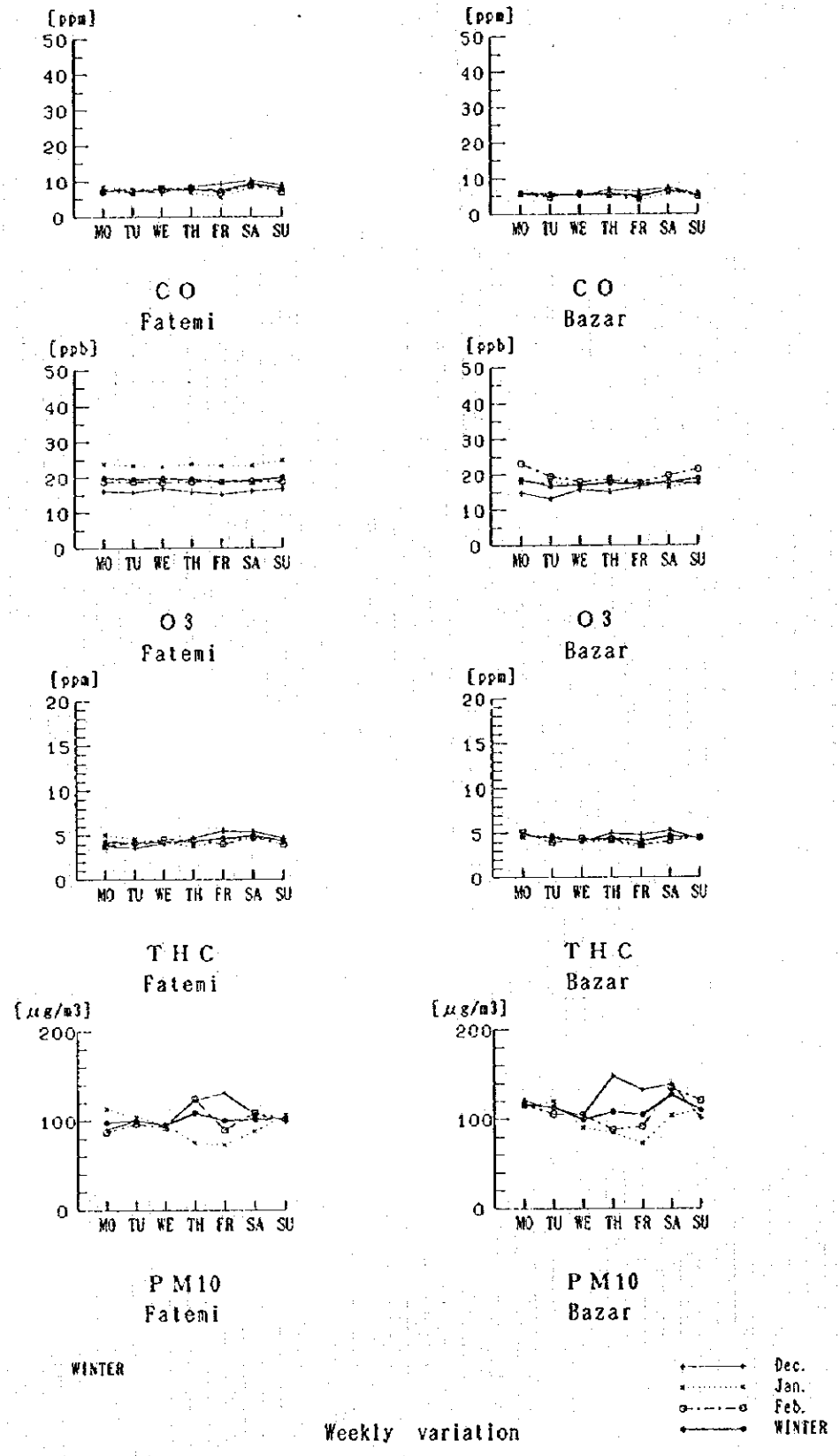


Fig.4.2.1-3(9) The 7-day variations of pollutant concentrations at Bazar and Fatemi based on monthly averages for every day of the week (October, 1995 ~ September, 1996).

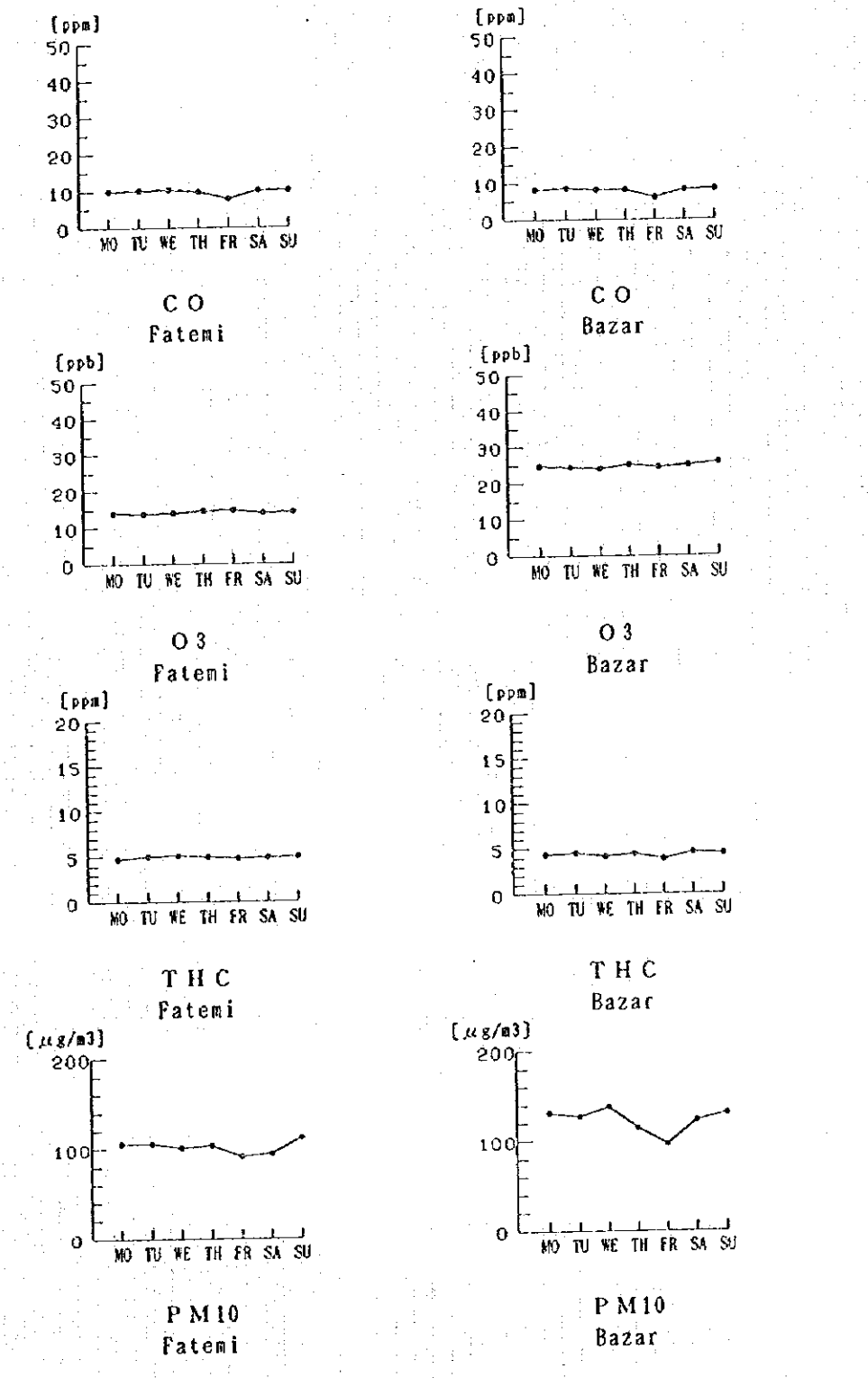


Fig.4.2.1-3(10) The 7-day variations of pollutant concentrations at Bazar and Fatemi based on monthly averages for every day of the week (October, 1995 ~ September, 1996).

② NO

Decrease in concentration on Friday is seen in autumn curves at both stations, and in summer and winter only at Fatemi. The Friday drop of the concentration is typical in August and November at Fatemi.

③ NO_2

The 7 day variations of each season at Bazar and Fatemi are similar to each other. In spring and winter, the concentration is almost constant. The variations in summer and autumn are also nearly constant, but the minimum on Friday can hardly be recognized.

④ CO

CO variations show the most typical pattern depending on the day of the week. All of the seasonal averaged curves at both stations reach the minimum on Friday. In particular, it is marked that concentrations in August and October at both stations drop down on Friday and recover on Saturday.

⑤ O_3

O_3 variations do not seem to depend on the day of the week, as all the seasonal averaged curves are flat. There are no particular fluctuations in these curves except in autumn at Bazar that falls to the minimum on Friday.

⑥ THC (Total hydrocarbon)

All of the features are similar to NO_2. In spring and winter, the concentration is almost constant. The concentrations in summer and autumn are also nearly constant, but the minimum on Friday is recognizable.

⑦ PM10

In summer and autumn, the curves are characterized by a drop on Friday and recovery on Saturday. Especially, the summer months at Bazar have the typical curves.

On the other hand, the spring curve at Bazar has the quite different feature compared to the other seasons, as its peak is reached on Wednesday, while the spring curve at Fatemi is flat. In winter, the peak day is Thursday at Fatemi and Saturday at Bazar.

On the basis of the annual averaged value for each day of the week, the variation range is very narrow, so that it is not easy to identify the variation pattern. Drop of the concentration on Friday is recognized in the variations of CO and PM10 at both stations, and NO at Fatemi and THC at Bazar, all of which are emitted from traffics. This feature suggests that the traffic volume is contributing to the concentration change. On the other hand, the concentrations of SO_2, NO_2 and O_3 are not considered to have close relation with the day of the week.

Regarding seasonal averaged values, the summer and autumn curves particularly show the weekly cycle with the minimum on Friday.

Pollutant source activities are supposed to have a kind of periodic regularity based on the day of the week. Such a periodic change is expected to influence variation of the pollutants concentration. The daily concentration, however, is affected by not only activities of sources but also atmospheric conditions, so that the statistics based on the short period data do not necessarily show the 7 day cycle. A larger number of data would be needed for such an analysis.

4.2.2 Meteorological aspects on air pollution in Tehran

(1) Influence of wind direction on pollutants concentration

Fig.4.2.4-1(1) - (2) shows the relationships between pollutant concentrations and wind direction at Bazar and Fatemi based on the monthly averages. The concentrations of SO_2, NO_2 and PM10 do not seem to depend on wind direction. On the other hand, the maximum NO concentration corresponds to northwesterlies at both stations, and comparatively high concentration is observed when the northerlies (WNW - ENE) are blowing. Such a feature is very typical in autumn. The concentrations of CO and THC tend to be high only at Fatemi under the northwesterlies (WNW - NNW) and northeasterlies (NE - E). Especially, it is noted that these concentrations in autumn at Fatemi have a much higher peak under the northwesterlies than in the other seasons.

Relationships between O_3 and wind direction are opposite to those of NO, CO and THC. The concentration reaches a high value when southerlies (E - WSW) blow. The O_3 concentration under the southerlies varies widely depending on the season especially at Bazar. The O_3 concentration in summer is exceptionally higher and that in winter is lower than in the other seasons, suggesting that solar radiation is more influential for the O_3 concentration than wind direction.

(2) Influence of wind speed on pollutants concentration

Fig.4.2.4-2(1) - (2) shows the relationships between the pollutant concentrations and wind speed at Bazar and Fatemi based on the monthly averages. The concentrations of all pollutants but O_3 and PM10 at both stations are inversely correlated to the wind speed. Especially, the concentration is reduced remarkably with increase in the wind speed in autumn and winter. These facts explain that the strong wind contributes to diffusion and transportation of pollutants, and that breezy conditions are favorable to the high concentration.

Notably, the concentrations at Fatemi get to the maximum when the wind speed is 2m/s, and is relatively low when the wind speed is less than 2m/s. This feature can not be seen at Bazar. It is considered that the traffic as the pollutant source through the road nearby

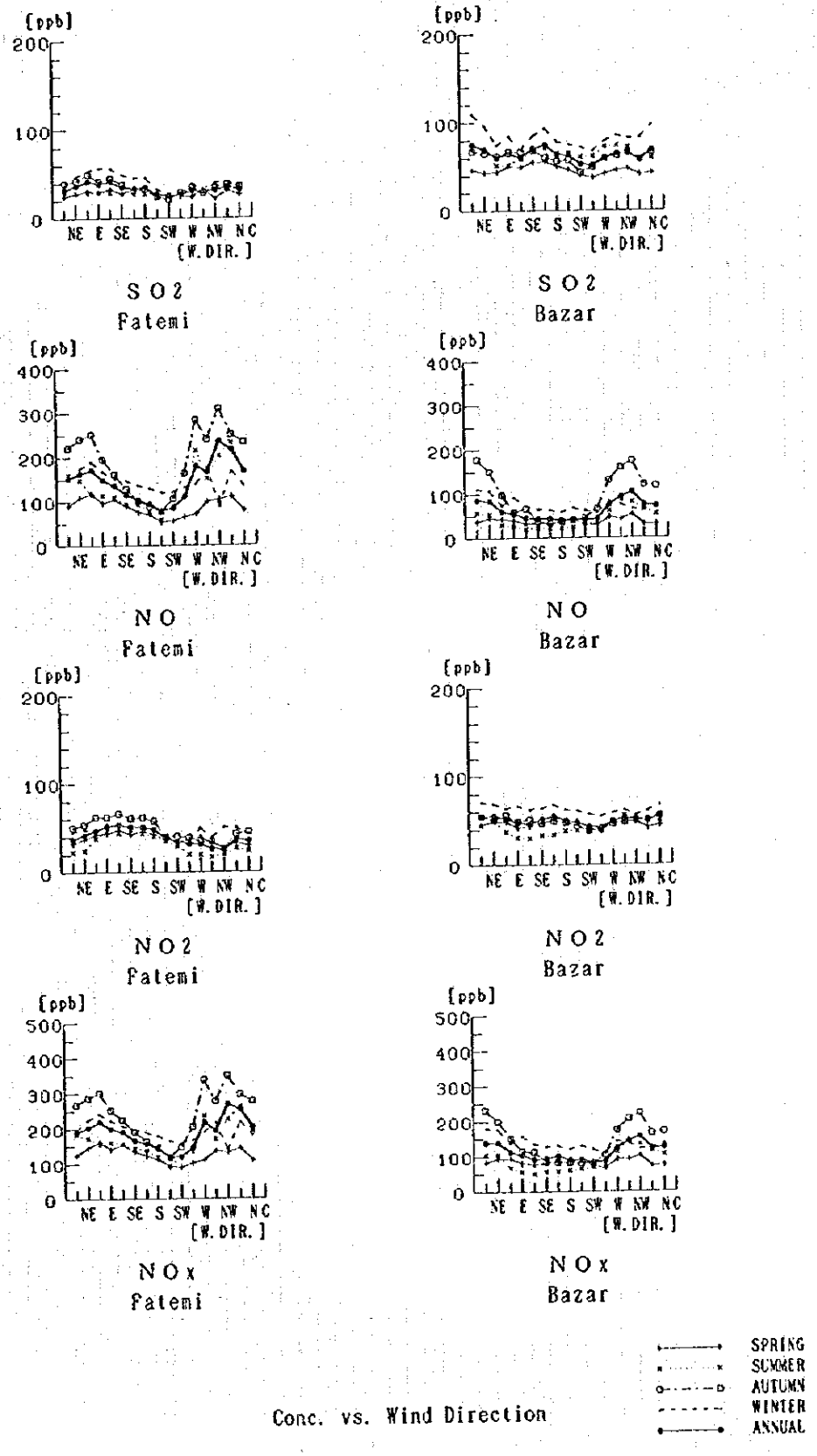


Fig.4.2.2-1(1) The relationships between pollutant concentrations and wind direction based on seasonal average data at Bazar and Fatemi (October, 1995 ~ September, 1996).

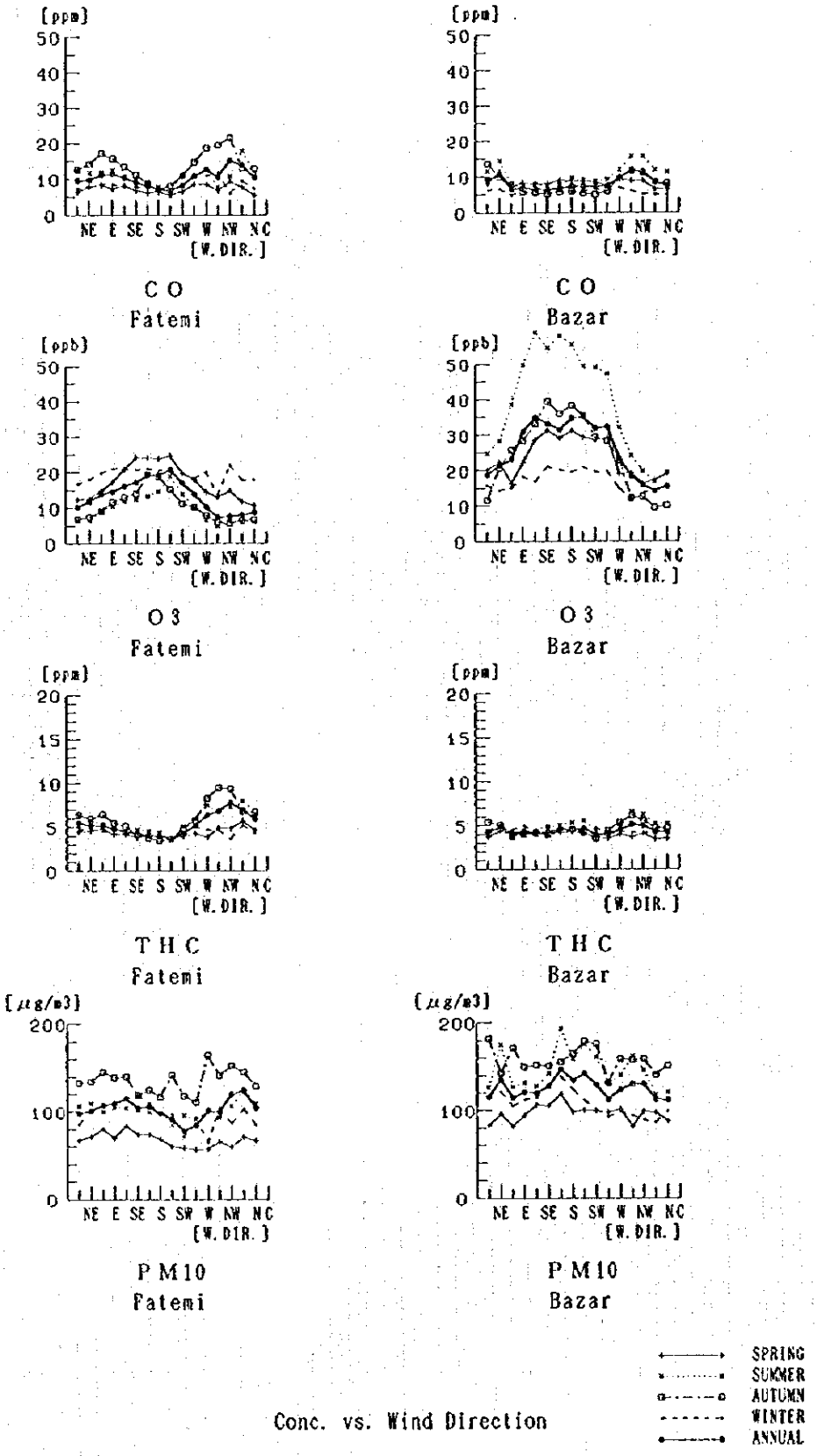


Fig.4.2.2-1(2) The relationships between pollutant concentrations and wind direction based on seasonal average data at Bazar and Fatemi (October, 1995 ~ September, 1996).

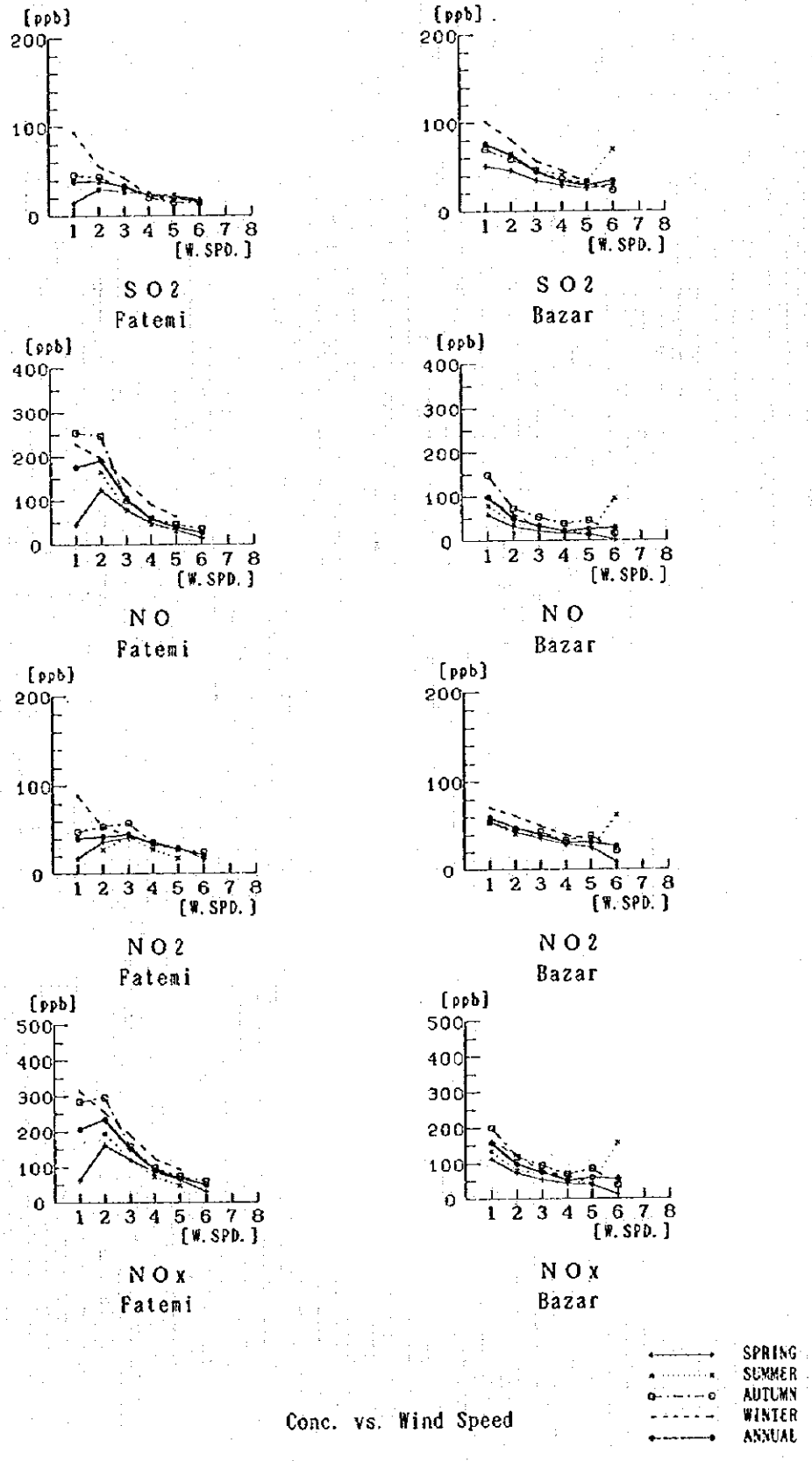


Fig.4.2.2-2(1) The relationships between pollutant concentrations and wind speed based on seasonal average data at Bazar and Fatemi (October, 1995 ~ September, 1996).

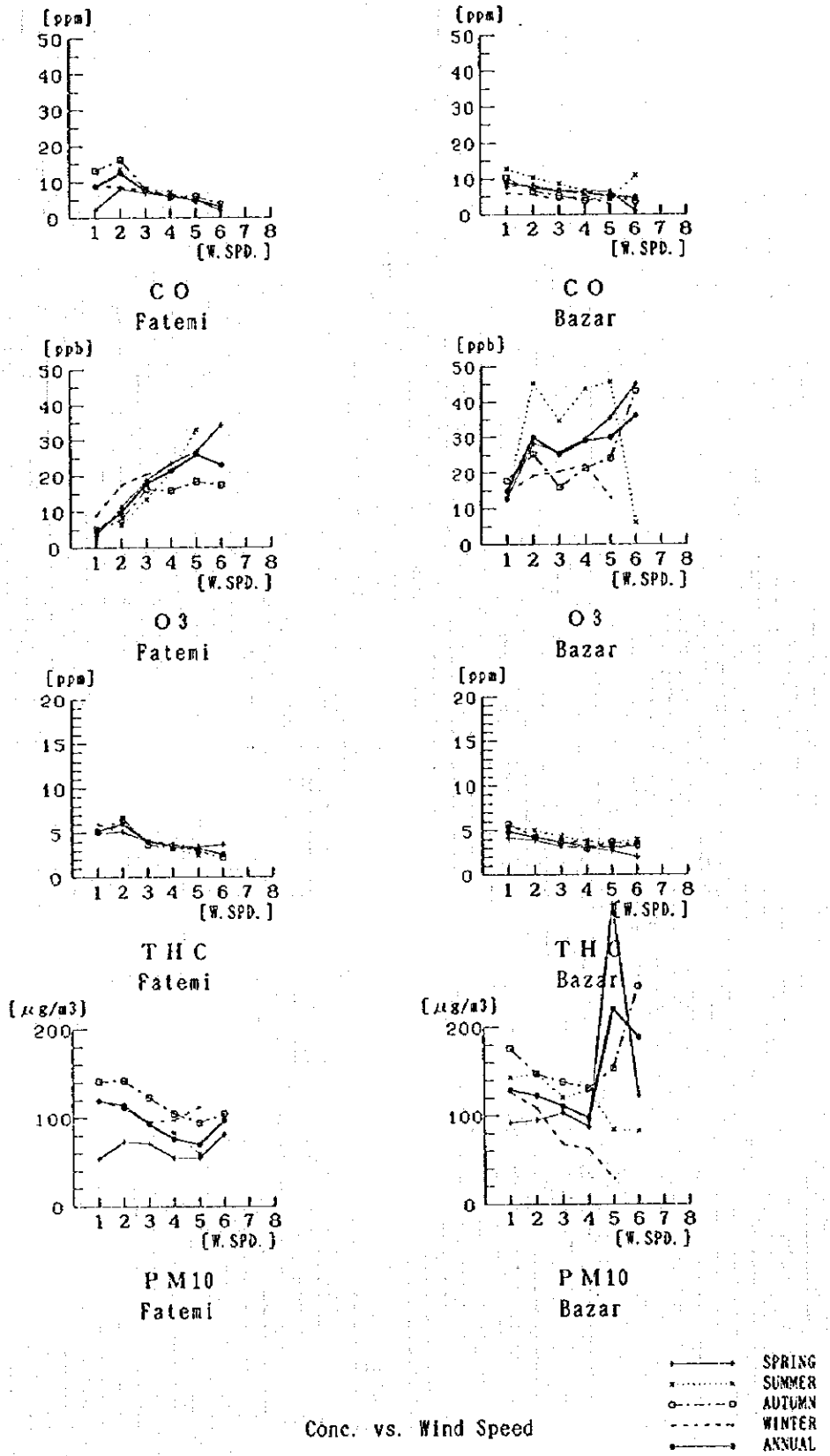


Fig.4.2.2-2(2) The relationships between pollutant concentrations and wind speed based on seasonal average data at Bazar and Fatemi (October, 1995 ~ September, 1996).

Fatemi is light at night particularly when the atmosphere near the ground surface becomes stable and winds calm down.

In contrast to these pollutants, the O_3 concentration increases in proportion to the wind speed. Photochemical reactions producing O_3 occur under the condition of high temperature and strong solar radiation. Active atmospheric turbulence and convection develop under the same condition with the above, so that increase in the O_3 concentration and wind speed is corresponding each other.

The concentration of PM10 reduces with the increase in the wind speed up to 4 - 5 m/s. If the wind is stronger than this criteria, increase in the wind speed is followed by the increased concentration. It is supposed that particles originated in the natural source such as soil will increase when the wind is stronger than 5 m/s.

Diurnal variations of the wind speed at Bazar and Fatemi in each month are shown in Fig.4.2.4-3. At Fatemi, the wind speed is comparatively large in the daytime (around 2m/s) and small in the night-time (less than 1m/s). The diurnal range of the wind speed is large in spring and small in winter. Such a diurnal change in the wind speed is considered to be due to development of the thermal convection in the daytime and stabilization of the surface boundary layer in the night-time. On the other hand, the wind speed at Bazar remains below 1m/s almost through the year, perhaps because the station at Bazar is surrounded by buildings. The difference in the wind speed between the two stations seems to somewhat affect the concentrations, explaining the local characteristics in the diurnal range of concentrations : Fatemi tends to show a wider range.

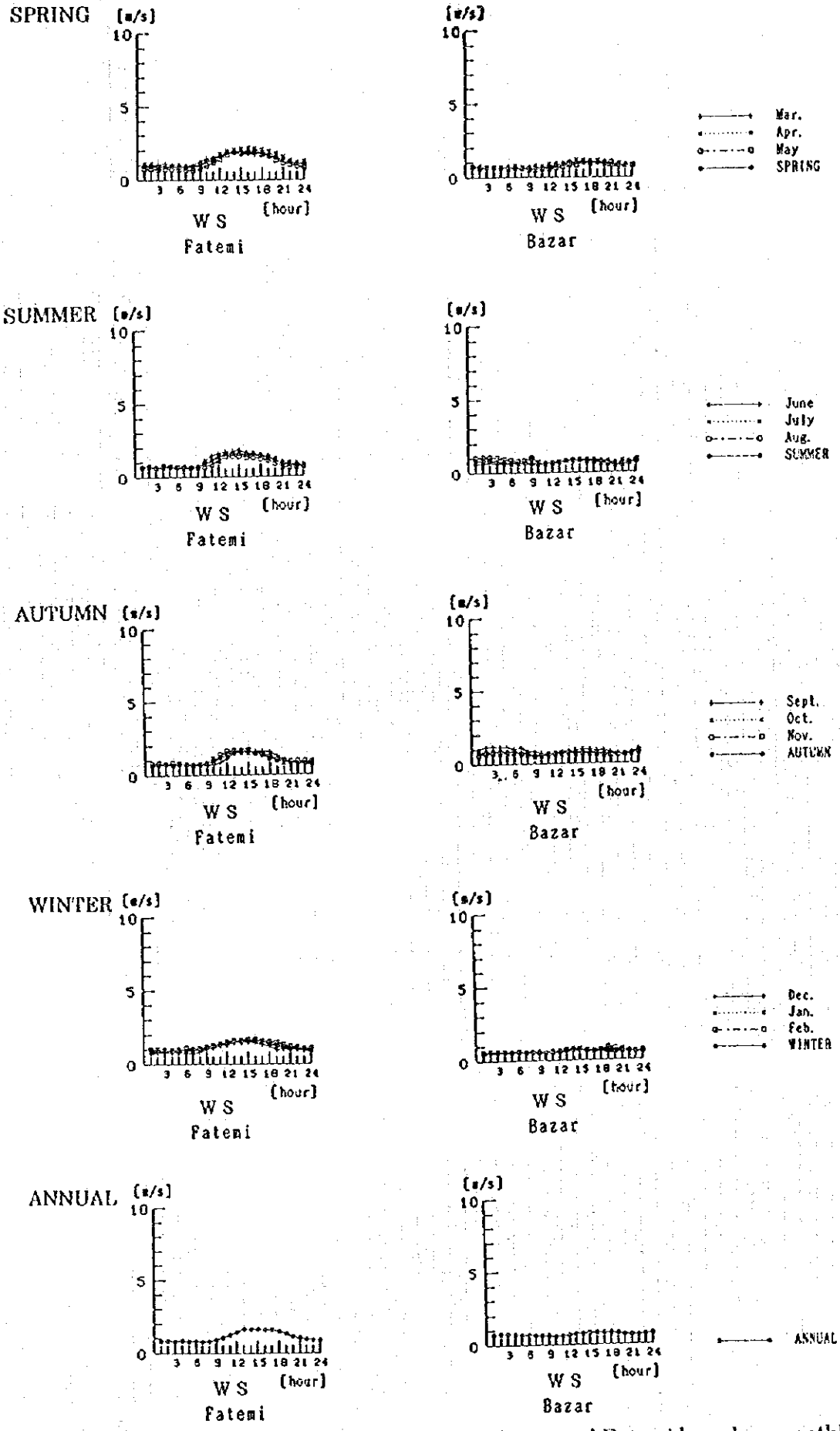


Fig.4.2.2-3 The diurnal variations of wind speed at Bazar and Fatemi based on monthly averages for every hour (October, 1995 ~ September, 1996).

4.2.3 Analysis of field survey

(1) Simplified and Additional measurements of pollutants

1) CO

The CO concentration data are shown in Tables 4.2.3-1(1) - (10); i.e. Tables 4.2.3-1(1) - (4) show the data for each day (=run) of the autumn measurement; Tables 4.2.3-1(5) shows the average data for each sampling point for the autumn measurement; and Tables 4.2.3-1(6) - (9) and (10) show those for the winter measurement. In theses tables, the mark of "*" on the data denotes that there was some error or mistake in the measurement. Most of these errors were caused by the delay of the starting time and time of sampling, and were seen in Autumn-Run 0, i.e. on the rehearsal day. The number of such errors, however, decreased obviously from the next run. Diurnal variation of the CO concentration at each measurement point is shown in Fig. 4.2.3-1(1) - (10) as well as Table 4.2.3-1. The figures of sampling points are arranged to make them correspond to the location of actual sampling points. In general, the concentrations at the sampling points No. 1, 2, 4 and 5 in the downtown area of the central part of MOT are higher than those in the other parts of the city, while the concentrations at the suburban points such as No. 9 and 12 are lower.

At the MOT government office building, vertical measurement of CO up to 50 m height at intervals of 10 m was carried out. In both measurement periods, the variation pattern of concentration at each height is very similar but its range becomes smaller as the height increases.

Table 4.2.3-2 shows the average concentration of all surface sampling points, i.e. No. 1 - 12 and 132, for each measurement day, so that the differences in the CO concentration by the day of the week and by season become clear, on the assumptions that each point represents its surroundings and that the averages of data at these surface points can be regarded as representing the concentration in most parts of MOT. Point No. 132 was chosen instead of No. 131 for the calculation of the average surface concentration because the HC sampling point of the MOT government office building was No. 132. Fig. 4.2.3-2 shows the diurnal variation of the CO concentration based on the average value mentioned above.

In general, the daytime concentrations in both seasons are similar, around 2 ppm. The differences in the diurnal variation between these periods are observed in the morning and

late evening. In autumn, the variation curve has two peaks, one in the morning and the other in the late evening, and the concentrations at both peaks are similar, about 6 ppm. In winter, the peak around 4 ppm appears in the morning as well as in autumn, but the peak of the late evening is not obvious. Probably, these differences can be explained to some extent by the difference of meteorological conditions during the measurement. Compared to autumn, wind near the surface is slightly stronger and surface inversion is not so intense in winter, so that pollutant trapping at the bottom of the atmosphere is not tight in the late evening.

Diurnal variation shows the typical difference in the concentration depending on the day of the week. It is recognized in both measurement periods that variation on Friday is distinguished from other days by lack of the morning peak. Because Friday is a holiday, usually there is no traffic peak in the morning, and traffic volume tends to be almost constant in the daytime and increase in the evening. Consequently, the unique characteristics of variation on Friday are appear to be caused by combination of the traffic volume and meteorological conditions such as the formation of surface inversion at night as mentioned in 4-1.

Background data of the CO concentration are shown in Table 4.2.3-3 with those of HC. The background samples were taken at the northeast (NE1 - 3) section of MOT on Oct. 17 '96, southwest (SW1 - 3) section of MOT on Oct. 18 '96 and along the way from MOT to the Caspian Sea on Oct. 18 '96. The background concentration taken at NE1, SW1, SW2 and SW3 are very low, because there are neither traffics nor houses near these points. Consequently, these data show the actual background data of GTA.

In addition, the CO concentration data in the spring measurement are shown in Appendix 4.2.3-A; the list and diurnal variation of CO at each measurement point are shown in Table 4.3.2-A1(1) - (4) and Fig. 4.3.2-A1(1) - (4), respectively; the average concentration data of all surface measurement point are shown in Table 4.3.2-A2 and Fig. 4.3.2-A2. In general, the CO concentration in spring is lower than that in autumn, while it is slightly higher than that in winter. Diurnal variation generally shows two peaks in the morning and in the late evening, though the evening peak is not clear as in autumn. The diurnal variation on Friday shows the lack of the morning peak like other two seasons.

Table 4.2.3-1(1) CO Concentration (1)

Autumn - Run 0
Oct. 8 '96

Sampling time	CO Concentration (ppm)					
	Point=1	2	3	4	5	6
1 (05:00-06:00)	1.36 *	2.95	- *	3.02	3.31 *	- *
2 (06:00-07:00)	9.30 *	5.32	3.75	6.77	5.53	3.64
3 (07:00-08:00)	9.45 *	6.23	5.48	6.71	4.06	5.42
4 (08:00-09:00)	6.45 *	8.29	7.62	5.39 *	2.16	2.57
5 (09:00-10:00)	4.45 *	5.40	6.25	5.14 *	3.03	2.39
6 (10:00-11:00)	2.69 *	5.09	4.67	4.55	2.35	2.26
7 (11:00-12:00)	2.29 *	3.96	4.30	2.72	2.24	2.48
8 (12:00-13:00)	1.85 *	3.16	3.50	2.53	1.96	2.05
9 (13:00-14:00)	1.53 *	3.02	3.23	3.90	2.12	1.82
10 (14:00-15:00)	1.65 *	2.83	2.95	3.05	1.89	1.70
11 (15:00-16:00)	1.68 *	3.23	3.38	2.97	1.74	1.79
12 (16:00-17:00)	1.79 *	4.19	4.60	4.45	1.94	2.18
13 (17:00-18:00)	2.16 *	4.15	6.92	7.49	2.19	3.04
14 (18:00-19:00)	5.97 *	4.95	6.05	9.39	4.85	5.05
15 (19:00-20:00)	9.15 *	9.55	6.95	10.32	7.23	9.32
16 (20:00-21:00)	16.17 *	9.38	6.74	7.06	7.98	8.79 *

Sampling time	CO Concentration (ppm)					
	Point=7	8	9	10	11	12
1 (05:00-06:00)	- *	3.37 *	- *	1.94 *	2.16 *	1.08 *
2 (06:00-07:00)	2.69	1.18 *	7.02 *	3.43	9.27 *	1.79 *
3 (07:00-08:00)	3.35	2.11 *	1.28	5.86	9.06 *	3.05 *
4 (08:00-09:00)	3.35	2.25 *	1.38	6.26 *	4.76 *	3.88 *
5 (09:00-10:00)	2.36	2.19 *	1.18	4.38 *	4.76 *	3.26 *
6 (10:00-11:00)	1.29	2.15 *	1.38	2.46 *	4.54 *	2.94 *
7 (11:00-12:00)	0.97	1.99 *	1.02	2.13 *	3.90 *	2.65 *
8 (12:00-13:00)	0.78	1.42 *	1.04	1.37 *	4.14 *	2.05 *
9 (13:00-14:00)	0.63	1.81 *	0.97	1.43 *	3.54 *	1.99 *
10 (14:00-15:00)	0.73	1.70 *	0.85	1.67 *	3.32 *	1.93 *
11 (15:00-16:00)	0.82	1.35 *	0.88	1.32 *	3.54 *	3.18 *
12 (16:00-17:00)	0.83	1.10 *	0.96	1.56 *	4.36 *	2.15 *
13 (17:00-18:00)	1.89	3.75 *	1.45	3.65 *	7.14 *	2.55 *
14 (18:00-19:00)	3.99	5.86 *	1.99	5.05 *	7.99 *	1.81 *
15 (19:00-20:00)	5.81	9.58 *	1.65	5.42 *	7.83 *	0.54 *
16 (20:00-21:00)	5.80	- *	2.34	8.65 *	9.12 *	1.28 *

Sampling time	CO Concentration (ppm)					
	Point=131	132	133	134	135	136
1 (05:00-06:00)	1.06	1.27 *	1.27 *	1.40 *	- *	- *
2 (06:00-07:00)	4.12	3.70	3.03	2.52	2.43	2.55
3 (07:00-08:00)	5.27	4.63	4.55	4.76	4.94	4.97
4 (08:00-09:00)	4.32	4.31	4.09	4.73	4.74	3.84
5 (09:00-10:00)	4.02	3.34	3.41	3.99	4.33	4.34
6 (10:00-11:00)	3.87	2.63	2.88	3.40	3.73	4.08
7 (11:00-12:00)	3.73	2.57	1.73	2.75	3.30	3.66
8 (12:00-13:00)	2.45	2.72	2.01	3.02	3.52	4.24
9 (13:00-14:00)	1.72	1.62	2.83	2.02	3.76	3.96
10 (14:00-15:00)	1.96	1.84	2.88	1.13	3.60	3.55
11 (15:00-16:00)	1.85	1.88	2.18	1.03	2.75	3.40
12 (16:00-17:00)	2.11	2.07	1.83	1.17	2.73	3.72
13 (17:00-18:00)	1.78	1.44	2.29	1.48	2.94	4.72
14 (18:00-19:00)	7.39	5.02	3.87	3.74	5.35	4.45
15 (19:00-20:00)	10.07	6.73	6.19	5.62	6.52	6.15
16 (20:00-21:00)	8.48	7.12	4.91	4.46	5.19	4.96

(Notes) - ; Missed data. * ; Data which includes some error

Table 4.2.3-1(2) CO Concentration (2)

Autumn - Run 1
Oct. 10 '96

Sampling time	CO Concentration (ppm)					
	Point=1	2	3	4	5	6
1 (05:00-06:00)	2.68	2.63	2.62 *	8.39	3.55	0.78
2 (06:00-07:00)	6.02	3.65	2.97	6.94	5.94	2.16
3 (07:00-08:00)	12.75	6.02	6.58 *	14.49	13.48	8.83
4 (08:00-09:00)	6.52	7.75	4.35	14.22	7.38	6.35
5 (09:00-10:00)	5.56	5.25	4.53	7.04	3.21	3.19
6 (10:00-11:00)	3.05	4.99	6.63	6.17	1.93	2.82
7 (11:00-12:00)	1.96	3.52	3.75	5.13	1.55	2.07
8 (12:00-13:00)	1.49	3.45	3.57	5.54	1.52	2.03
9 (13:00-14:00)	1.32	4.26	3.35	4.26	1.93	2.28
10 (14:00-15:00)	1.28	3.23	2.56	10.53	1.64	2.02
11 (15:00-16:00)	1.19	3.04	2.30	3.49	1.89	2.07
12 (16:00-17:00)	3.52	4.72	1.99	5.06	2.77	2.59
13 (17:00-18:00)	9.16	5.45	2.79	4.11	4.25	4.85
14 (18:00-19:00)	10.38	7.12	7.37	6.01	6.79	5.25
15 (19:00-20:00)	9.94	6.93	6.95	7.09	8.85	9.62
16 (20:00-21:00)	7.18	5.08	3.78	5.98	8.58	13.14

Sampling time	CO Concentration (ppm)					
	Point=7	8	9	10	11	12
1 (05:00-06:00)	9.56	2.72 *	0.70	1.82	1.72	0.91
2 (06:00-07:00)	6.82	4.38	1.00	3.97	5.19	1.44
3 (07:00-08:00)	7.74	6.02	1.44	8.68	4.72	1.66
4 (08:00-09:00)	6.42	2.65	1.56	4.85	7.61	1.86
5 (09:00-10:00)	2.94	2.46	1.66	5.85	5.25	2.06
6 (10:00-11:00)	1.59	2.50	1.34	3.02	3.80	3.45
7 (11:00-12:00)	1.28	2.49	1.39	2.10	3.28	3.11
8 (12:00-13:00)	0.97	2.22	1.45	2.21	2.73	2.85
9 (13:00-14:00)	0.91	1.91	1.25	2.22	2.57	2.98
10 (14:00-15:00)	1.13	1.35	1.16	1.77	2.19	3.16
11 (15:00-16:00)	1.19	1.41	1.37	1.82	2.96	2.89
12 (16:00-17:00)	1.69	1.30	2.12	1.31	2.00	3.13
13 (17:00-18:00)	2.44	3.50	4.94	2.21	1.91	2.35
14 (18:00-19:00)	3.02	5.58	2.86	2.18	1.15 *	2.12
15 (19:00-20:00)	3.16	5.29	2.13	2.33	1.36	2.35
16 (20:00-21:00)	2.72	4.75	2.19	2.00	1.09	1.08

Sampling time	CO Concentration (ppm)					
	Point=131	132	133	134	135	136
1 (05:00-06:00)	2.58 *	3.25 *	2.45 *	2.43 *	2.55 *	2.35 *
2 (06:00-07:00)	2.55	2.93	2.41	2.40	2.63	2.54
3 (07:00-08:00)	6.66	6.31	6.13	6.12	5.93	6.08
4 (08:00-09:00)	6.60	6.45	6.30	6.75	6.50	6.56
5 (09:00-10:00)	6.43	5.35	5.25	6.12	7.05	6.38
6 (10:00-11:00)	4.27	2.82	2.43	3.75	4.14	4.15
7 (11:00-12:00)	3.39	2.37	2.01	3.15	4.37	3.58
8 (12:00-13:00)	2.95	1.83	1.65	2.78	3.45	3.36
9 (13:00-14:00)	2.48	1.82	1.50	2.80	3.62	3.42
10 (14:00-15:00)	2.06	1.63	1.37	3.17	3.41	3.47
11 (15:00-16:00)	1.56	1.28	1.03	2.13	2.54	2.45
12 (16:00-17:00)	2.84	1.96	1.59	1.65	2.82	2.71
13 (17:00-18:00)	3.06	2.73	2.42	2.73	3.14	2.88
14 (18:00-19:00)	3.47	3.14	3.13	3.08	3.50	3.40
15 (19:00-20:00)	2.78	2.62	2.64	2.58	3.55	3.02
16 (20:00-21:00)	2.02	1.94	1.98	1.94	2.71	2.37

(Notes) - ; Missed data. * ; Data which includes some error

Table 4.2.3-1(3) CO Concentration (3)

Autumn - Run 2
Oct. 11 '96

Sampling time	CO Concentration (ppm)					
	Point=1	2	3	4	5	6
1 (05:00-06:00)	0.93	0.51	0.40 *	2.60	1.58 *	0.50 *
2 (06:00-07:00)	0.50	1.54	0.98	2.23	2.87	1.68
3 (07:00-08:00)	2.57	2.23	2.36	3.22	3.55	2.52
4 (08:00-09:00)	3.59	2.34	1.45	3.24	3.25	4.18
5 (09:00-10:00)	2.29	3.37	1.41	4.22	1.69	2.62
6 (10:00-11:00)	2.12	2.88	2.52	5.46	1.73	2.26
7 (11:00-12:00)	1.54	2.55	3.12	4.78	1.93	2.06
8 (12:00-13:00)	1.32	2.28	2.71	3.89	1.63	1.75
9 (13:00-14:00)	1.03	2.02	2.40	3.07	2.03	1.63
10 (14:00-15:00)	0.90	1.88	2.34	2.88	1.96	1.51
11 (15:00-16:00)	1.04	1.98	2.21	2.81	2.03	1.58
12 (16:00-17:00)	1.36	2.41	1.83	3.42	2.22	1.96
13 (17:00-18:00)	1.88	4.59	3.65	8.05	2.20	4.61
14 (18:00-19:00)	7.33	6.78	4.35	9.51	9.32	6.75
15 (19:00-20:00)	6.16	8.28	4.12	10.12	13.16	8.08
16 (20:00-21:00)	6.08	12.42	5.49	14.35	15.75	6.86

Sampling time	CO Concentration (ppm)					
	Point=7	8	9	10	11	12
1 (05:00-06:00)	0.80 *	1.11 *	0.75 *	0.43	0.45	0.44
2 (06:00-07:00)	1.23	1.44	1.01	0.48	0.47	0.40
3 (07:00-08:00)	2.15	2.10	1.63	0.50	0.75	0.52
4 (08:00-09:00)	3.15	3.49	1.94	1.40	1.09	1.55
5 (09:00-10:00)	1.62	5.03	1.82	1.03	1.87	0.97
6 (10:00-11:00)	1.11	2.12	1.63	1.31	2.95	1.07
7 (11:00-12:00)	1.28	2.21	1.28	1.39	2.91	1.40
8 (12:00-13:00)	1.13	2.44	1.24	1.18	2.11	1.24
9 (13:00-14:00)	1.05	1.58	1.29	1.85	1.77	1.26
10 (14:00-15:00)	1.20	1.35	1.34	1.40	1.91	1.82
11 (15:00-16:00)	1.42	1.08	1.17	1.39	2.50	1.47
12 (16:00-17:00)	2.04	1.42	1.12	1.50	2.11	1.64
13 (17:00-18:00)	2.53	4.11	2.31	3.00	6.15	2.57
14 (18:00-19:00)	6.74	9.95	5.69	5.60	4.69	1.93
15 (19:00-20:00)	5.03	7.29	8.06	5.12	6.14	2.03
16 (20:00-21:00)	4.54	8.04	8.07	4.30	4.65	0.91

Sampling time	CO Concentration (ppm)					
	Point=131	132	133	134	135	136
1 (05:00-06:00)	0.72	0.53	0.64	0.58	0.63	0.55
2 (06:00-07:00)	0.81	0.68	0.61	0.64	0.66	0.60
3 (07:00-08:00)	1.38	1.16	1.13	1.30	1.01	0.95
4 (08:00-09:00)	2.49	2.04	2.03	2.53	1.91	2.01
5 (09:00-10:00)	3.02	2.00	2.31	2.76	1.59	1.53
6 (10:00-11:00)	2.96	1.93	1.98	2.35	1.29	1.53
7 (11:00-12:00)	2.89 *	1.68	1.90	2.56	1.30	1.61
8 (12:00-13:00)	2.48 *	1.44	1.58	2.35	1.03	0.86
9 (13:00-14:00)	2.33 *	1.19	1.18	2.07	0.90	0.85
10 (14:00-15:00)	1.84	0.99	1.14	1.65	0.88	0.86
11 (15:00-16:00)	1.76	1.13	0.90	0.89	1.12	0.81
12 (16:00-17:00)	1.63	0.94	0.83	0.84	1.05	0.82
13 (17:00-18:00)	2.82	2.26	1.88	1.84	1.98	1.82
14 (18:00-19:00)	3.95	3.38	3.13	3.11	3.28	2.93
15 (19:00-20:00)	3.40	2.84	2.52	3.06	2.38	2.31
16 (20:00-21:00)	3.93	3.42	3.15	- *	3.30	3.15

(Notes) - ; Missed data. * ; Data which includes some error

Table 4.2.3-1(4) CO Concentration (4)

Autumn - Run 3
Oct. 12 '96

Sampling time	CO Concentration (ppm)					
	Point=1	2	3	4	5	6
1 (05:00-06:00)	1.28	1.38	1.29	6.80	2.73	1.20
2 (06:00-07:00)	4.92	4.38	3.18	11.28	7.70	2.72
3 (07:00-08:00)	10.97	8.15	6.21	12.93	13.26	6.91
4 (08:00-09:00)	7.03	5.25	2.98	8.79	7.52	3.79
5 (09:00-10:00)	3.62	4.64	3.99	4.94	1.80	3.19
6 (10:00-11:00)	1.53	2.41	2.96	4.04	1.40	2.89
7 (11:00-12:00)	1.28	2.64	2.72	4.29	1.83	2.51
8 (12:00-13:00)	2.11	2.07	2.77	3.48	2.25	2.28
9 (13:00-14:00)	1.50	2.18	2.24	3.85	2.46	2.32
10 (14:00-15:00)	1.43	2.25	2.19	3.39	2.14	1.89
11 (15:00-16:00)	1.51	2.36	2.24	3.51 *	2.48	2.70
12 (16:00-17:00)	2.07	3.76	2.58	4.63	3.55	2.68 *
13 (17:00-18:00)	3.08	5.25	4.21	6.23	2.05	3.72
14 (18:00-19:00)	4.14	7.54	6.17	9.12	3.57	4.84
15 (19:00-20:00)	3.13	7.02	7.55	6.42	3.88	5.48
16 (20:00-21:00)	3.95	6.20	6.65	8.16	3.78	4.35

Sampling time	CO Concentration (ppm)					
	Point=7	8	9	10	11	12
1 (05:00-06:00)	3.14	2.45	0.94	0.98	0.93	0.54
2 (06:00-07:00)	3.88	2.74	1.74	2.59	3.77	2.30
3 (07:00-08:00)	7.64	7.19	2.73	6.72	5.96	2.99
4 (08:00-09:00)	3.45	3.28	1.50	5.24	3.92	2.21 *
5 (09:00-10:00)	1.31	1.58	1.90	3.14	3.73	1.96
6 (10:00-11:00)	1.07	1.73	1.49	2.16	2.64	1.63
7 (11:00-12:00)	1.25	1.96	1.49	1.90	2.44	1.55
8 (12:00-13:00)	1.61	1.98	1.43	2.15	2.61	2.02
9 (13:00-14:00)	- *	1.42	1.77	2.34	1.95	1.96
10 (14:00-15:00)	1.74	1.23	1.36	1.99	2.15	1.52
11 (15:00-16:00)	1.72	1.35	1.33	1.96	2.42	1.74
12 (16:00-17:00)	- *	1.44	1.35	3.05	2.67	1.61
13 (17:00-18:00)	2.46 *	1.15	1.56	3.16	3.58	1.92
14 (18:00-19:00)	3.65	1.61	2.41	4.37	6.84	1.92
15 (19:00-20:00)	3.39	2.29	1.59	3.56	6.13	2.60
16 (20:00-21:00)	4.24	4.63	1.50	5.34	7.43	2.21

Sampling time	CO Concentration (ppm)					
	Point=131	132	133	134	135	136
1 (05:00-06:00)	0.79	1.49	-	0.85	0.92	0.89
2 (06:00-07:00)	3.99	7.09	3.71	3.42	2.98	2.60
3 (07:00-08:00)	7.54	7.36	6.86	6.80	5.57	5.07
4 (08:00-09:00)	4.50	5.12	4.40	4.75	4.34	4.27
5 (09:00-10:00)	2.75	2.28	2.28 *	2.73	2.45	1.98
6 (10:00-11:00)	2.65	1.74	1.75	2.75	1.80	1.20
7 (11:00-12:00)	2.94	2.09	1.90	2.62	1.81	1.29
8 (12:00-13:00)	2.80	1.92	1.94	2.42	1.95	1.30
9 (13:00-14:00)	2.62	1.75	1.50 *	1.60	1.95	1.43
10 (14:00-15:00)	2.05	1.15	1.25	1.17	1.95	1.66
11 (15:00-16:00)	1.96	1.33	1.45	1.22	2.24	1.60
12 (16:00-17:00)	2.13	1.48	1.38	1.41	1.89	1.75
13 (17:00-18:00)	2.85 *	2.77	2.38	2.37	3.13	2.54
14 (18:00-19:00)	3.82	3.99	3.82	3.73	4.73	3.68
15 (19:00-20:00)	3.68	3.72	3.46	3.46	4.01	3.43
16 (20:00-21:00)	3.45	3.28	3.02	2.95	3.23	2.92

(Notes) - ; Missed data. * ; Data which includes some error

Table 4.2.3-1(5) CO Concentration (5)

Autumn Run 0-3

4 days average (Oct. 8,10,11,12 '96)

Sampling time	CO Concentration(ppm) Point=1	2	3	4	5	6
1 (05:00-06:00)	1.56 *	1.87	1.44 *	5.20	2.79 *	0.83 *
2 (06:00-07:00)	5.19 *	3.72	2.72	6.81	5.51	2.55
3 (07:00-08:00)	8.94 *	5.66	5.16 *	9.34	8.59	5.92
4 (08:00-09:00)	5.90 *	5.91	4.10	7.91 *	5.08	4.22
5 (09:00-10:00)	3.98 *	4.67	4.05	5.34 *	2.43	2.85
6 (10:00-11:00)	2.35 *	3.84	4.20	5.06	1.85	2.56
7 (11:00-12:00)	1.77 *	3.17	3.47	4.23	1.89	2.28
8 (12:00-13:00)	1.69 *	2.74	3.14	3.86	1.84	2.03
9 (13:00-14:00)	1.35 *	2.87	2.81	3.77	2.14	2.01
10 (14:00-15:00)	1.32 *	2.55	2.51	4.96	1.91	1.78
11 (15:00-16:00)	1.36 *	2.65	2.53	3.20 *	2.04	2.04
12 (16:00-17:00)	2.19 *	3.77	2.75	4.39	2.62	2.35 *
13 (17:00-18:00)	4.07 *	4.86	4.39	6.47	2.67	4.06
14 (18:00-19:00)	6.96 *	6.60	5.99	8.51	6.13	5.47
15 (19:00-20:00)	7.10 *	7.95	6.39	8.49	8.28	8.13
16 (20:00-21:00)	8.35 *	8.27	5.66	8.89	9.02	8.29 *

Sampling time	CO Concentration(ppm) Point=7	8	9	10	11	12
1 (05:00-06:00)	4.50 *	2.41 *	0.80 *	1.29 *	1.32	0.74
2 (06:00-07:00)	3.66	2.44 *	2.69 *	2.62	4.68	1.48
3 (07:00-08:00)	5.22	4.36 *	1.77	5.44	5.12	2.06
4 (08:00-09:00)	4.09	2.92 *	1.60	4.44 *	4.35	2.38 *
5 (09:00-10:00)	2.06	2.82 *	1.64	3.60 *	3.90	2.06
6 (10:00-11:00)	1.27	2.13 *	1.46	2.24 *	3.48	2.27
7 (11:00-12:00)	1.20	2.16 *	1.30	1.88 *	3.13	2.18
8 (12:00-13:00)	1.12	2.02 *	1.29	1.73 *	2.90	2.04
9 (13:00-14:00)	0.86 *	1.68 *	1.32	1.96 *	2.46	2.05
10 (14:00-15:00)	1.20	1.41 *	1.18	1.71 *	2.39	2.11
11 (15:00-16:00)	1.29	1.30 *	1.19	1.62 *	2.86	2.32
12 (16:00-17:00)	1.52 *	1.32 *	1.39	1.86 *	2.79	2.13
13 (17:00-18:00)	2.33 *	3.13 *	2.57	3.01 *	4.70	2.35
14 (18:00-19:00)	4.35	5.75 *	3.24	4.30 *	5.17	1.95
15 (19:00-20:00)	4.35	6.11 *	3.36	4.11 *	5.37	1.88
16 (20:00-21:00)	4.33	5.81 **	3.53	5.07 *	5.57	1.37

Sampling time	CO Concentration(ppm) Point=131	132	133	134	135	136
1 (05:00-06:00)	1.29 *	1.64 *	1.45 *	1.32 *	1.37 *	1.26 *
2 (06:00-07:00)	2.87	3.60	2.44	2.25	2.18	2.07
3 (07:00-08:00)	5.21	4.87	4.67	4.75	4.36	4.27
4 (08:00-09:00)	4.48	4.48	4.21	4.69	4.38	4.17
5 (09:00-10:00)	4.06	3.24	3.31	3.90	3.86	3.56
6 (10:00-11:00)	3.44	2.28	2.26	3.06	2.74	2.74
7 (11:00-12:00)	3.24 *	2.18	1.89	2.77	2.70	2.54
8 (12:00-13:00)	2.67 *	1.98	1.80	2.64	2.49	2.44
9 (13:00-14:00)	2.29 *	1.60	1.75	2.12	2.56	2.42
10 (14:00-15:00)	1.98	1.40	1.66	1.78	2.46	2.39
11 (15:00-16:00)	1.78	1.41	1.39	1.32	2.16	2.07
12 (16:00-17:00)	2.18	1.61	1.41	1.27	2.12	2.25
13 (17:00-18:00)	2.63 *	2.30	2.24	2.11	2.80	2.99
14 (18:00-19:00)	4.66	3.88	3.49	3.42	4.22	3.62
15 (19:00-20:00)	4.98	3.98	3.70	3.68	4.12	3.73
16 (20:00-21:00)	4.47	3.94	3.27	3.12 *	3.61	3.35

(Notes) - ; Missed data. * ; Data which includes some error

Table 4.2.3-1(6) CO Concentration (6)

Winter - Run 1
Feb. 22 '97

Sampling time	CO Concentration (ppm) Point=1	2	3	4	5	6
1 (05:00-06:00)	1.10	0.81	0.94	1.56	2.01	1.25 *
2 (06:00-07:00)	1.95	2.14	1.97	2.98	2.22	2.16
3 (07:00-08:00)	2.84	5.60	6.93	7.62	- *	4.73
4 (08:00-09:00)	2.55	6.76	7.01	5.94	2.20	3.83
5 (09:00-10:00)	2.58	4.76	5.82	5.28	1.97	3.00
6 (10:00-11:00)	1.85	3.13	4.38	3.88	1.61	2.19
7 (11:00-12:00)	1.31	2.29	2.74	3.91	1.48	1.82
8 (12:00-13:00)	0.96	2.08	3.13	3.42	1.52	2.05
9 (13:00-14:00)	1.06	2.18	2.23	3.17	3.31	2.20
10 (14:00-15:00)	1.49	1.33	1.99	3.71	1.53	2.15
11 (15:00-16:00)	1.74	1.71	1.93	3.54	1.59	2.13
12 (16:00-17:00)	2.43	1.56	1.92	4.35	2.07	2.28
13 (17:00-18:00)	2.44	2.02	2.52	5.03	2.95	2.95
14 (18:00-19:00)	3.61	1.78	4.00	6.72	2.05	2.78
15 (19:00-20:00)	4.16	1.56	2.74	5.67	1.75	2.94
16 (20:00-21:00)	3.04	1.42	2.65	5.63	2.29	1.44

Sampling time	CO Concentration (ppm) Point=7	8	9	10	11	12
1 (05:00-06:00)	3.35 *	- *	1.38 *	2.82 *	2.19	0.85
2 (06:00-07:00)	2.25	1.15	1.21	3.65	2.85	1.40
3 (07:00-08:00)	2.17	2.58	2.32	4.24	3.92	1.55
4 (08:00-09:00)	1.43	2.04	1.36	2.93	2.79	2.53
5 (09:00-10:00)	1.46	1.82	1.25	3.72	3.21	2.15
6 (10:00-11:00)	1.33	1.84	1.39	2.55	2.62	1.49
7 (11:00-12:00)	1.15	1.98	1.50	1.66	1.99	0.90
8 (12:00-13:00)	1.14	2.02	1.45	2.53	1.99	0.88
9 (13:00-14:00)	1.04	1.73	1.60	1.72	1.83	1.12
10 (14:00-15:00)	1.31	1.99	1.63	2.38	2.00	1.24
11 (15:00-16:00)	1.50	1.84	1.46	3.04	2.17	1.15
12 (16:00-17:00)	1.57	1.44	1.32	3.72	2.15	1.70
13 (17:00-18:00)	2.03	1.62	1.67 *	3.53	3.11	1.60
14 (18:00-19:00)	2.51	1.78	1.31	4.23	3.08	2.22
15 (19:00-20:00)	2.73	1.43	1.16	3.73	2.63	2.03
16 (20:00-21:00)	1.69	1.12	0.98	3.58	2.39	2.03

Sampling time	CO Concentration (ppm) Point=131	132	133	134	135	136
1 (05:00-06:00)	0.98	0.90	0.94	1.00	0.87	0.76 *
2 (06:00-07:00)	1.22	1.37	1.27	1.28	1.32	1.16
3 (07:00-08:00)	1.83	1.65	1.76	1.85	1.98	1.81
4 (08:00-09:00)	1.95	1.76	1.95	1.90	2.12	1.73
5 (09:00-10:00)	1.83	2.03	1.89	1.90	2.44	1.92
6 (10:00-11:00)	1.75	2.45 *	1.75	1.62	2.14	1.59
7 (11:00-12:00)	1.52	1.51	1.45	1.20	1.02	0.93
8 (12:00-13:00)	1.43	1.85	1.42	1.07	1.14	1.05
9 (13:00-14:00)	1.41	1.51	1.79	1.05	1.32	0.93
10 (14:00-15:00)	1.24	1.17	1.57	1.35	1.15	0.75
11 (15:00-16:00)	0.98	1.26	1.28	1.13	1.18	0.80
12 (16:00-17:00)	1.44	1.34	1.52	1.64	1.19	1.09
13 (17:00-18:00)	2.01	2.00	1.91	1.94	1.64	1.55
14 (18:00-19:00)	3.09	2.79	2.49	2.42	2.31	2.03
15 (19:00-20:00)	2.48	2.43	2.44	2.44	2.06	2.29
16 (20:00-21:00)	1.87	1.92	1.89	1.83	2.09	1.68

(Notes) - ; Missed data. * ; Data which includes some error

Table 4.2.3-1(7) CO Concentration (7)

Winter - Run 2
Feb. 24 '97

Sampling time	CO Concentration (ppm)					
	Point=1	2	3	4	5	6
1 (05:00-06:00)	2.46	2.41	2.32	2.74	3.42 *	1.27 *
2 (06:00-07:00)	5.13	3.95	3.36	7.25	5.15	3.54
3 (07:00-08:00)	10.03	8.36	4.96	4.63 *	7.56	5.93
4 (08:00-09:00)	8.30	5.79	4.33	7.22	4.66	4.44
5 (09:00-10:00)	4.44	3.00	2.83	5.64	3.08	3.05
6 (10:00-11:00)	2.76	3.37	3.13	3.73	1.79	1.92
7 (11:00-12:00)	2.08	2.73	3.08	3.17	1.42	2.04
8 (12:00-13:00)	1.18	2.27	2.77	3.96	1.32	2.13
9 (13:00-14:00)	1.33	1.74	2.13	2.69	1.46	1.86
10 (14:00-15:00)	1.08	1.90	2.02	2.71	1.38	1.41
11 (15:00-16:00)	1.43	1.61	2.34	2.61	1.17	1.55
12 (16:00-17:00)	1.29	2.07	2.37	2.96	1.42	1.74
13 (17:00-18:00)	2.41	3.31	4.04	3.25	2.32	2.15
14 (18:00-19:00)	2.23	3.89	4.25	4.02	2.43	2.18
15 (19:00-20:00)	1.64	3.93	5.55	4.24	1.85	2.90
16 (20:00-21:00)	2.13	3.49	5.89	4.83	2.14	2.86

Sampling time	CO Concentration (ppm)					
	Point=7	8	9	10	11	12
1 (05:00-06:00)	4.35	2.60 *	0.86 *	2.46	3.37	1.21
2 (06:00-07:00)	3.74	4.14	1.30	3.19	5.35	1.37
3 (07:00-08:00)	5.07	7.03	2.89	6.05	10.26	1.32
4 (08:00-09:00)	5.05	5.37	3.82	6.33	7.63	1.87
5 (09:00-10:00)	2.54	2.04	1.39	3.83	3.86	2.93
6 (10:00-11:00)	1.94	1.84	0.98	1.80	2.05	1.58
7 (11:00-12:00)	1.72	2.23	1.10	1.52	1.76	1.36
8 (12:00-13:00)	1.38	2.01	0.99	1.65	1.66	1.34
9 (13:00-14:00)	0.85	1.98	1.16	1.21	1.54	1.39
10 (14:00-15:00)	0.91	1.77	0.88	1.56	1.44	1.15
11 (15:00-16:00)	1.12	1.67	0.82	1.90	1.46	0.99
12 (16:00-17:00)	0.82	1.20	0.81	1.63	2.03	1.05
13 (17:00-18:00)	1.03	2.88	1.24	2.21	1.63	0.57
14 (18:00-19:00)	1.04	3.74	1.74	2.46	1.84	0.52
15 (19:00-20:00)	2.48	2.11	1.05	2.77	3.58	1.50
16 (20:00-21:00)	1.14	1.29	1.15	4.08	5.65	1.19

Sampling time	CO Concentration (ppm)					
	Point=131	132	133	134	135	136
1 (05:00-06:00)	2.10	2.24	2.05	1.99	2.44	2.33
2 (06:00-07:00)	3.06	2.95	2.75	2.61	2.75	2.76
3 (07:00-08:00)	5.01	4.95	4.85	4.73	5.36	3.87
4 (08:00-09:00)	5.33	4.74	4.74	5.02	4.86	4.93
5 (09:00-10:00)	2.48	2.23	2.21	2.30	2.59	2.19
6 (10:00-11:00)	1.71	1.30	1.49	1.33	1.81	1.27
7 (11:00-12:00)	1.45	1.11	1.51	1.04	1.33	1.02
8 (12:00-13:00)	1.18	0.94	1.25	0.71	0.94	0.79
9 (13:00-14:00)	1.50	0.94	1.24	0.93	1.09	1.02
10 (14:00-15:00)	1.45	0.98	1.30	1.01	1.16	1.04
11 (15:00-16:00)	1.38	0.95	0.98	1.02	1.15	1.08
12 (16:00-17:00)	0.90	1.99	1.01	0.78	1.20	0.98
13 (17:00-18:00)	2.25	2.45	2.18	2.03	1.94	1.67
14 (18:00-19:00)	2.79	2.91	2.73	2.38	2.26	1.25
15 (19:00-20:00)	1.38	1.54	1.45	1.18	1.14	0.96
16 (20:00-21:00)	1.81	1.82	1.86	1.63	2.16	1.40

(Notes) - ; Missed data. * ; Data which includes some error

Table 4.2.3-1(8) CO Concentration (8)

Winter - Run 3
Feb. 26 '97

Sampling time	CO Concentration (ppm)					
	Point=1	2	3	4	5	6
1 (05:00-06:00)	1.36	1.88	1.60	1.85	2.44	1.07
2 (06:00-07:00)	4.52	4.04	3.16	3.25	3.55	2.35
3 (07:00-08:00)	9.23	11.32	7.14	7.13	7.45	6.76
4 (08:00-09:00)	4.37	10.65	7.16	8.00	4.17	6.30
5 (09:00-10:00)	2.69	4.49	6.85	5.16	2.45	3.52
6 (10:00-11:00)	5.63	3.95	4.92	4.75	4.26	3.84
7 (11:00-12:00)	2.64	5.37	4.78	7.49	6.53	6.95
8 (12:00-13:00)	5.26	4.26	2.26	5.26	5.12	3.50
9 (13:00-14:00)	2.37	2.23	0.89	3.23	2.42	1.76
10 (14:00-15:00)	2.63	2.50	1.65	3.09	2.93	1.94
11 (15:00-16:00)	2.59	2.85	3.10	4.44	2.27	2.05
12 (16:00-17:00)	1.95	3.32	3.81	4.44	2.85	2.19
13 (17:00-18:00)	2.51	4.63	4.23	4.63	3.95	2.85
14 (18:00-19:00)	2.46	3.77	4.01	4.50	3.94	2.95
15 (19:00-20:00)	2.16	3.78	2.88	3.86	3.93	3.49
16 (20:00-21:00)	3.28	2.97	2.07	5.26	1.95	3.86

Sampling time	CO Concentration (ppm)					
	Point=7	8	9	10	11	12
1 (05:00-06:00)	0.96	1.15	0.82	1.30	0.75	0.40
2 (06:00-07:00)	2.55	2.66	1.49	2.95	1.77	1.10
3 (07:00-08:00)	3.45	2.71	3.35	4.45	7.17	1.21
4 (08:00-09:00)	3.01	3.14	2.14	2.87	3.76	0.91
5 (09:00-10:00)	1.62	2.32	2.21	2.52	3.21	1.00
6 (10:00-11:00)	2.30	4.05	1.40	3.11	1.78	0.95
7 (11:00-12:00)	3.40	4.43	1.67	4.76	2.53	1.63
8 (12:00-13:00)	4.07	5.49	2.06	4.05	1.99	1.72
9 (13:00-14:00)	1.01	2.36	1.14	1.49	2.14	1.06
10 (14:00-15:00)	0.85	2.39	1.13	1.19	2.15	1.12
11 (15:00-16:00)	0.99	1.98	1.12	1.24	2.90	0.65
12 (16:00-17:00)	1.14	1.87	1.18	1.31	2.76	0.78
13 (17:00-18:00)	1.17	2.76	1.32	1.34	3.65	1.25
14 (18:00-19:00)	1.31	3.25	1.00	1.65	4.88	0.92
15 (19:00-20:00)	1.00	2.30	0.76	1.27	3.04	0.82
16 (20:00-21:00)	1.23	1.28	0.77	3.17	2.01 *	0.83

Sampling time	CO Concentration (ppm)					
	Point=131	132	133	134	135	136
1 (05:00-06:00)	0.68	0.62	0.59	0.71	0.62	0.65
2 (06:00-07:00)	1.65	1.65	1.66	1.60	1.47	1.34
3 (07:00-08:00)	3.34	3.19	3.25	3.15	3.94	3.02
4 (08:00-09:00)	2.81	2.65	2.94	2.61	3.13	2.83
5 (09:00-10:00)	1.83	1.71	1.71	1.65	1.76	1.80
6 (10:00-11:00)	3.85	3.07	3.25	3.24	3.09	3.09
7 (11:00-12:00)	5.06	4.35	4.75	4.46	4.20	5.12
8 (12:00-13:00)	4.95	4.36	4.60	4.33	- *	3.42
9 (13:00-14:00)	1.75	1.62	1.99	1.26	1.22	1.54
10 (14:00-15:00)	2.15 *	1.64	1.82	1.64	- *	1.63
11 (15:00-16:00)	1.57	1.50	1.51	- *	1.31	1.21
12 (16:00-17:00)	1.76	1.44	1.77	1.37	1.48	1.42
13 (17:00-18:00)	3.24	2.81	2.75	2.92	1.82	2.53
14 (18:00-19:00)	3.05	2.89	2.72	2.86	2.89	2.57
15 (19:00-20:00)	2.07	1.83	1.78	1.79	1.57	1.44
16 (20:00-21:00)	1.63	1.67	1.69	1.78	1.51	1.40

(Notes) - ; Missed data. * ; Data which includes some error

Table 4.2.3-1(9) CO Concentration (9)

Winter - Run 4
Feb. 28 '97

Sampling time	CO Concentration (ppm)					
	Point=1	2	3	4	5	6
1 (05:00-06:00)	0.80	1.12	1.41	0.87	0.90	0.58
2 (06:00-07:00)	0.99	1.64	1.69	1.27	0.98	1.13
3 (07:00-08:00)	2.20	1.93	1.80	2.63	1.74	2.26
4 (08:00-09:00)	3.23	1.68	1.89	2.70	2.41	1.67
5 (09:00-10:00)	1.73	2.02	2.21	2.98	2.85	2.45
6 (10:00-11:00)	2.57	2.55	2.36	2.92	2.12	2.21
7 (11:00-12:00)	2.29	2.56	2.96	3.16	1.72	1.72
8 (12:00-13:00)	1.69	2.29	2.83	2.68	1.61	1.77
9 (13:00-14:00)	1.44	1.80	2.25	2.20	1.08	1.88
10 (14:00-15:00)	1.12	1.37	1.72	2.36	1.30	1.35
11 (15:00-16:00)	1.02	1.60	2.07	1.97	1.18	1.41
12 (16:00-17:00)	1.03	1.53	2.45	2.74 *	1.29	1.57
13 (17:00-18:00)	1.52	1.83	2.58	2.81	1.57	1.72
14 (18:00-19:00)	1.82 *	3.20	4.55	3.49	2.05	2.91
15 (19:00-20:00)	2.84	3.95	5.23	5.23	2.32	2.87
16 (20:00-21:00)	4.62	4.90	4.42	7.17	4.78	4.45

Sampling time	CO Concentration (ppm)					
	Point=7	8	9	10	11	12
1 (05:00-06:00)	1.71	- *	0.55	1.33	0.80	0.64
2 (06:00-07:00)	1.96	0.56	0.58	1.27	1.15	0.86
3 (07:00-08:00)	2.16	0.73	0.62	2.54	1.85	1.14
4 (08:00-09:00)	2.42	0.97	0.72	2.19	1.86	1.17
5 (09:00-10:00)	1.80	1.23	0.72	2.94	2.00	1.34
6 (10:00-11:00)	1.60	1.32	0.79	2.31	2.24	1.68
7 (11:00-12:00)	2.18	1.29	1.08	2.39	2.15	1.30
8 (12:00-13:00)	1.62	1.04	0.75	2.74	- *	1.33
9 (13:00-14:00)	1.31	1.00	0.76	2.21	1.54	1.13
10 (14:00-15:00)	1.26	0.85	1.00	1.35	1.61	1.15
11 (15:00-16:00)	1.54	1.14	0.93	1.54	1.75	1.23
12 (16:00-17:00)	1.14	0.84	0.95	2.30	1.86	0.97
13 (17:00-18:00)	1.40	1.01	0.69	1.98	1.88	0.97
14 (18:00-19:00)	1.52	1.21	0.99	3.75	2.54	1.57
15 (19:00-20:00)	2.32	1.34	0.85	4.07	4.13	1.82
16 (20:00-21:00)	2.34	1.24	0.94	3.85	5.35 *	1.52

Sampling time	CO Concentration (ppm)					
	Point=131	132	133	134	135	136
1 (05:00-06:00)	0.58	0.49	0.85	0.77 *	0.64 *	0.64 *
2 (06:00-07:00)	0.75	0.65	0.65	0.83	0.69	0.68
3 (07:00-08:00)	1.62	1.15	1.29	1.37	1.20	1.14
4 (08:00-09:00)	2.25	1.65	1.79	2.08	1.41	1.47
5 (09:00-10:00)	2.53	2.61	2.29	2.01	1.88	1.89
6 (10:00-11:00)	2.10	2.56	1.71	1.69	1.73	1.45
7 (11:00-12:00)	2.58	2.58	2.02	1.56	1.63	1.5
8 (12:00-13:00)	2.48	2.59	1.72	1.54	1.26	1.19
9 (13:00-14:00)	2.05	2.63	1.38	1.03	0.92	0.95
10 (14:00-15:00)	1.93	0.92	1.06	1.47	0.94	0.84
11 (15:00-16:00)	1.62	1.09	1.25	1.30	0.90	0.84
12 (16:00-17:00)	1.37	1.03	1.32	1.66	1.10	0.84
13 (17:00-18:00)	1.59	1.26	1.17	1.28	1.12	1.06
14 (18:00-19:00)	1.56	1.54	1.50	1.73	1.38	1.31
15 (19:00-20:00)	2.40	2.21	3.14	2.15	1.91	1.81
16 (20:00-21:00)	3.17	2.67	2.73	3.08	2.68	2.61

(Notes) - ; Missed data. * ; Data which includes some error

Table 4.2.3-1(10) CO Concentration (10)

Winter Run 1-4

4 days average (Feb. 22,24,26,28 '97)

Sampling time	CO Concentration(ppm) Point=1	2	3	4	5	6
1 (05:00-06:00)	1.43	1.56	1.57	1.76	2.19 *	1.04 *
2 (06:00-07:00)	3.15	2.94	2.55	3.69	2.98	2.30
3 (07:00-08:00)	6.08	6.80	5.21	5.50 *	5.58 *	4.92
4 (08:00-09:00)	4.61	6.22	5.10	5.97	3.36	4.06
5 (09:00-10:00)	2.86	3.57	4.43	4.77	2.59	3.01
6 (10:00-11:00)	3.20	3.25	3.70	3.82	2.45	2.54
7 (11:00-12:00)	2.08	3.24	3.39	4.43	2.79	3.13
8 (12:00-13:00)	2.27	2.73	2.75	3.83	2.39	2.36
9 (13:00-14:00)	1.55	1.99	1.88	2.82	2.07	1.93
10 (14:00-15:00)	1.58	1.78	1.85	2.97	1.79	1.71
11 (15:00-16:00)	1.70	1.94	2.36	3.14	1.55	1.79
12 (16:00-17:00)	1.68	2.12	2.64	3.62 *	1.91	1.95
13 (17:00-18:00)	2.22	2.95	3.34	3.93	2.70	2.42
14 (18:00-19:00)	2.53 *	3.16	4.20	4.68	2.62	2.71
15 (19:00-20:00)	2.70	3.31	4.10	4.75	2.46	3.05
16 (20:00-21:00)	3.27	3.20	3.76	5.72	2.79	3.15

Sampling time	CO Concentration(ppm) Point=7	8	9	10	11	12
1 (05:00-06:00)	2.59 *	- *	0.90 *	1.98 *	1.78	0.78
2 (06:00-07:00)	2.63	2.13	1.15	2.77	2.78	1.18
3 (07:00-08:00)	3.21	3.26	2.30	4.32	5.80	1.31
4 (08:00-09:00)	2.98	2.88	2.01	3.58	4.01	1.62
5 (09:00-10:00)	1.86	1.85	1.39	3.25	3.07	1.86
6 (10:00-11:00)	1.79	2.26	1.14	2.44	2.17	1.43
7 (11:00-12:00)	2.11	2.48	1.34	2.68	2.11	1.30
8 (12:00-13:00)	2.05	2.64	1.31	2.74	1.88 *	1.32
9 (13:00-14:00)	1.05	1.77	1.17	1.66	1.76	1.18
10 (14:00-15:00)	1.08	1.75	1.16	1.62	1.80	1.17
11 (15:00-16:00)	1.29	1.66	1.08	1.93	2.07	1.01
12 (16:00-17:00)	1.17	1.34	1.07	2.24	2.20	1.13
13 (17:00-18:00)	1.41	2.07	1.23 *	2.27	2.57	1.10
14 (18:00-19:00)	1.60	2.50	1.26	3.02	3.09	1.31
15 (19:00-20:00)	2.13	1.80	0.96	2.96	3.35	1.54
16 (20:00-21:00)	1.60	1.23	0.96	3.67	3.85 *	1.39

Sampling time	CO Concentration(ppm) Point=131	132	133	134	135	136
1 (05:00-06:00)	1.09	1.06	1.11	1.12 *	1.14 *	1.10 *
2 (06:00-07:00)	1.67	1.66	1.58	1.58	1.56	1.49
3 (07:00-08:00)	2.95	2.74	2.79	2.78	3.12	2.46
4 (08:00-09:00)	3.09	2.70	2.86	2.90	2.88	2.74
5 (09:00-10:00)	2.17	2.15	2.03	1.97	2.17	1.95
6 (10:00-11:00)	2.35	2.35	2.05	1.97	2.19	1.85
7 (11:00-12:00)	2.65	2.39	2.43	2.07	2.05	2.14
8 (12:00-13:00)	2.51	2.44	2.25	1.91	1.11 *	1.61
9 (13:00-14:00)	1.68	1.68	1.60	1.07	1.14	1.11
10 (14:00-15:00)	1.69 *	1.18	1.44	1.37	1.08 *	1.07
11 (15:00-16:00)	1.39	1.20	1.26	1.15 *	1.14	0.98
12 (16:00-17:00)	1.37	1.45	1.41	1.36	1.24	1.08
13 (17:00-18:00)	2.27	2.13	2.00	2.04	1.63	1.70
14 (18:00-19:00)	2.62	2.53	2.36	2.35	2.21	1.79
15 (19:00-20:00)	2.08	2.00	2.20	1.89	1.67	1.63
16 (20:00-21:00)	2.12	2.02	2.04	2.08	2.11	1.77

(Notes) - ; Missed data. * ; Data which includes some error

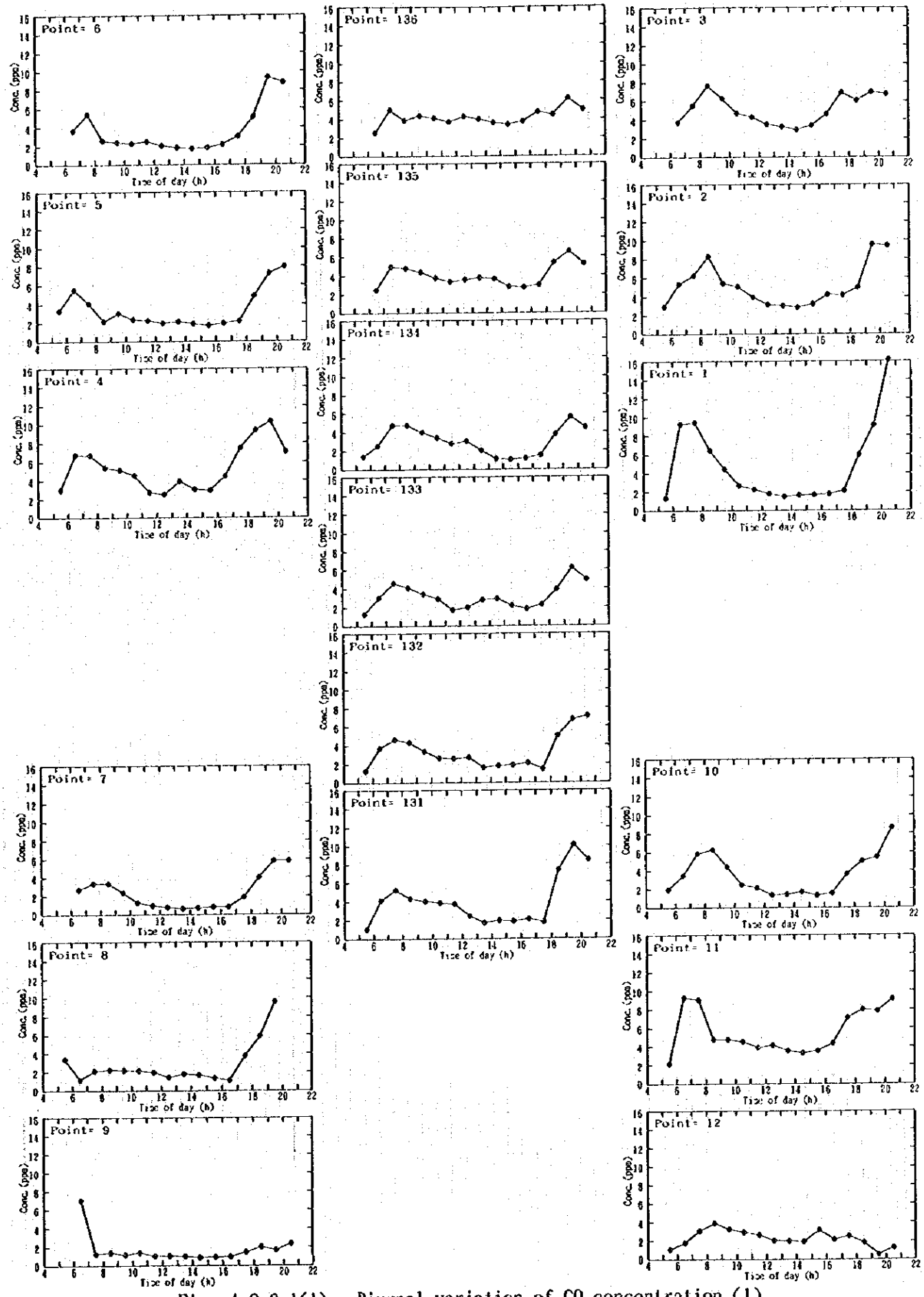


Fig. 4.2.3-1(1) Diurnal variation of CO concentration (1)

Autumn - Run 0 Oct. 8 '96

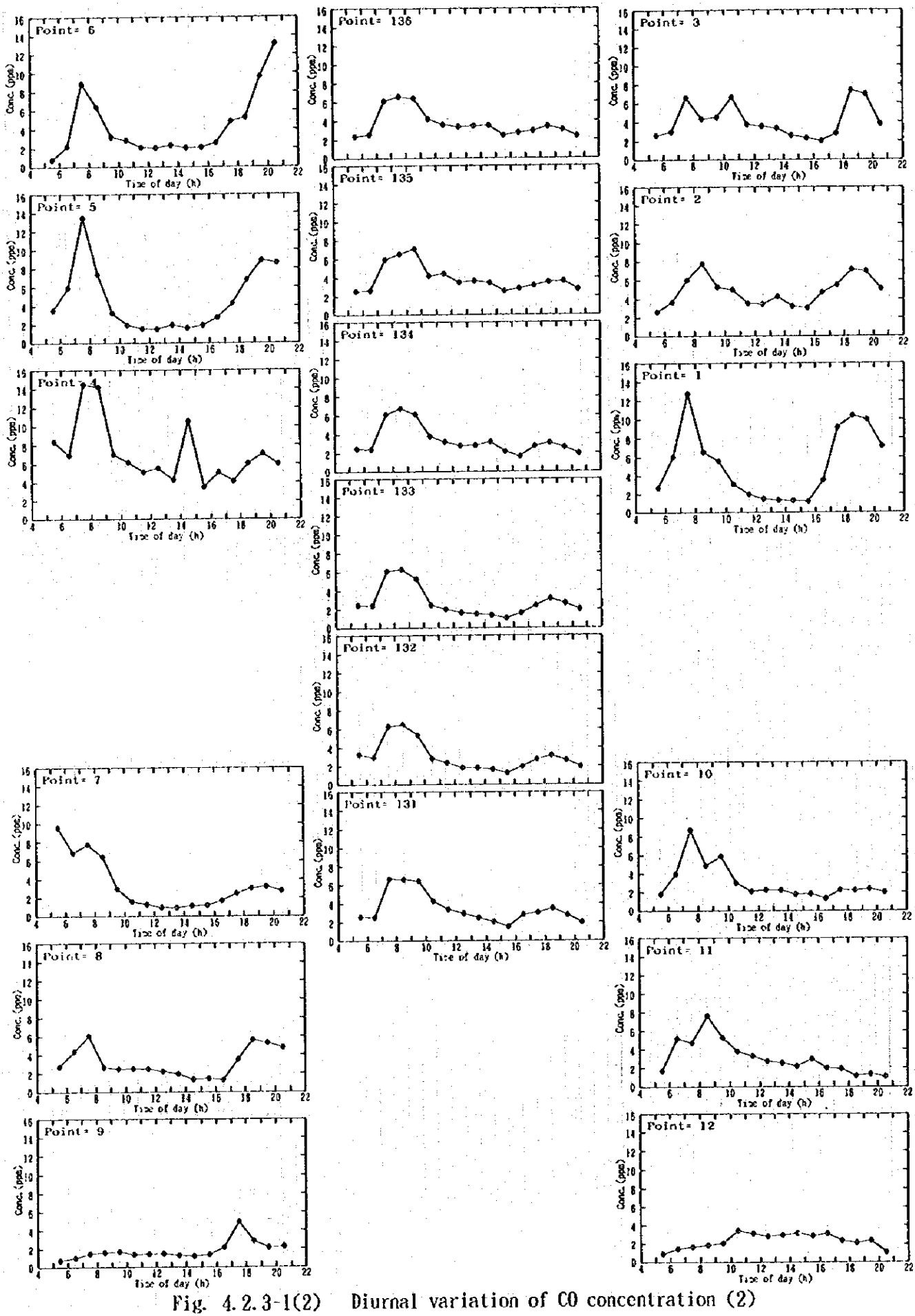


Fig. 4.2.3-1(2) Diurnal variation of CO concentration (2)

Autumn - Run 1 Oct. 10 '96

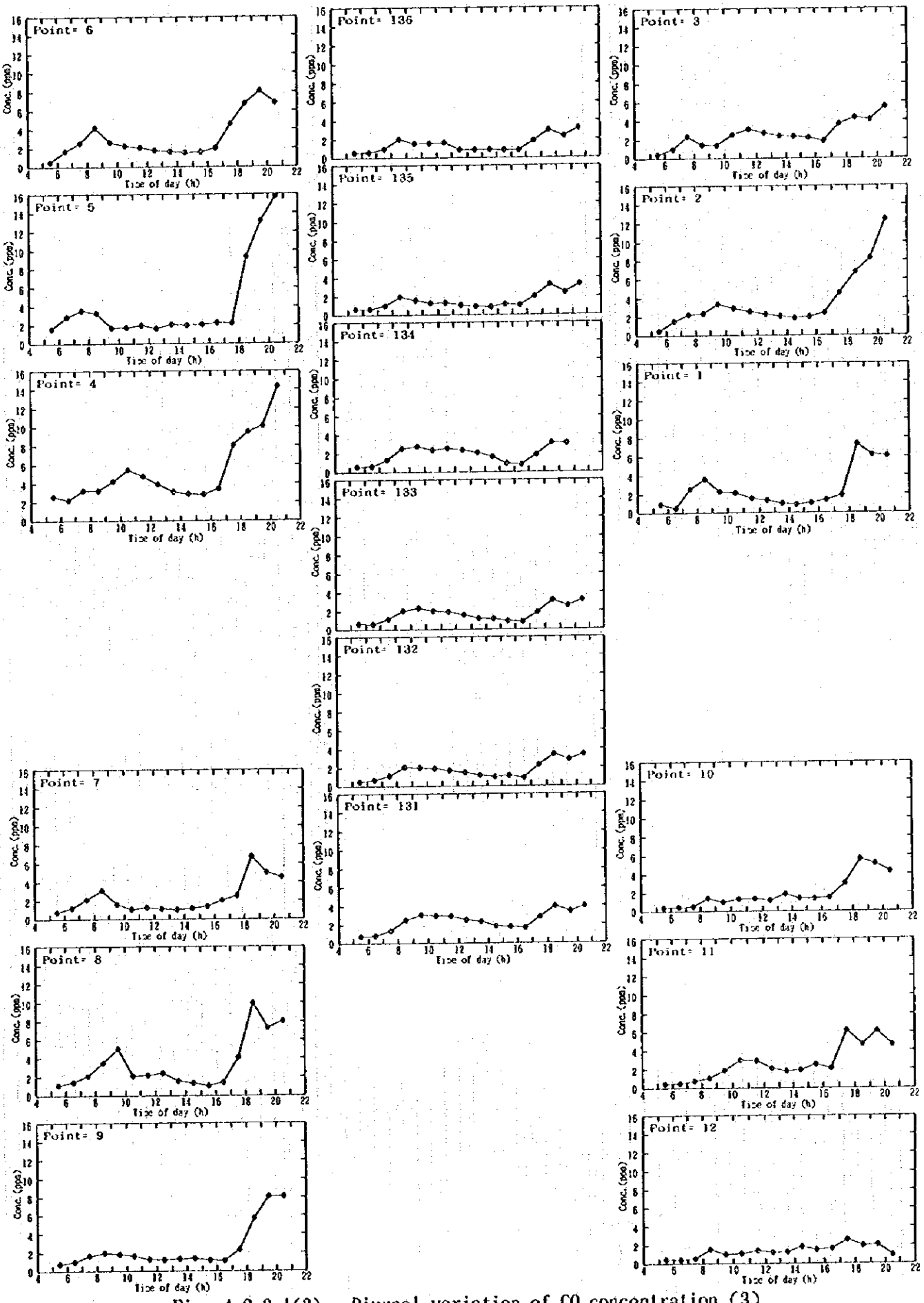


Fig. 4.2.3-1(3) Diurnal variation of CO concentration (3)

Autumn - Run 2 OCT. 11 '96

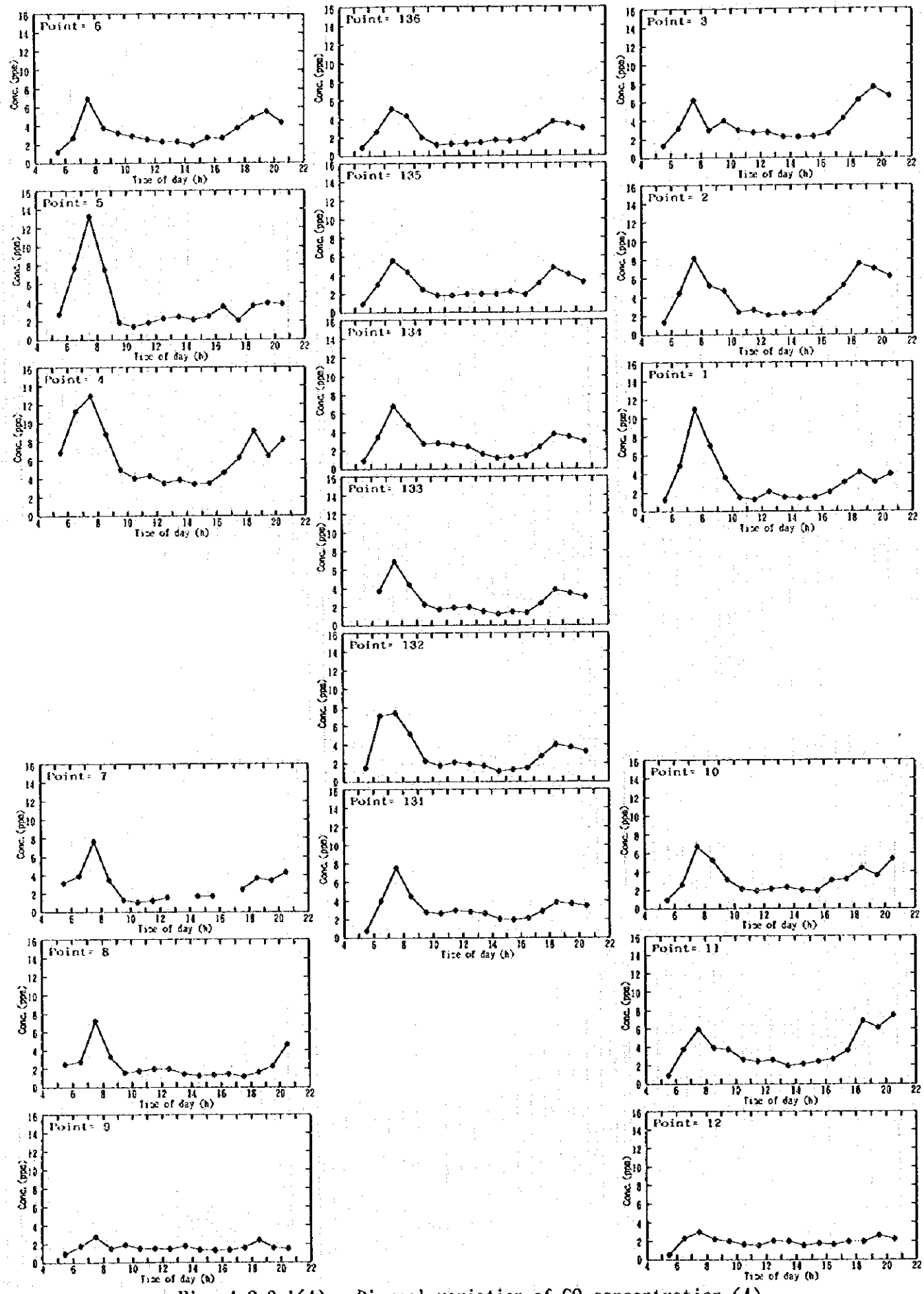


Fig. 4.2.3-1(4) Diurnal variation of CO concentration (4)
Autumn - Run 3 Oct. 12 '96

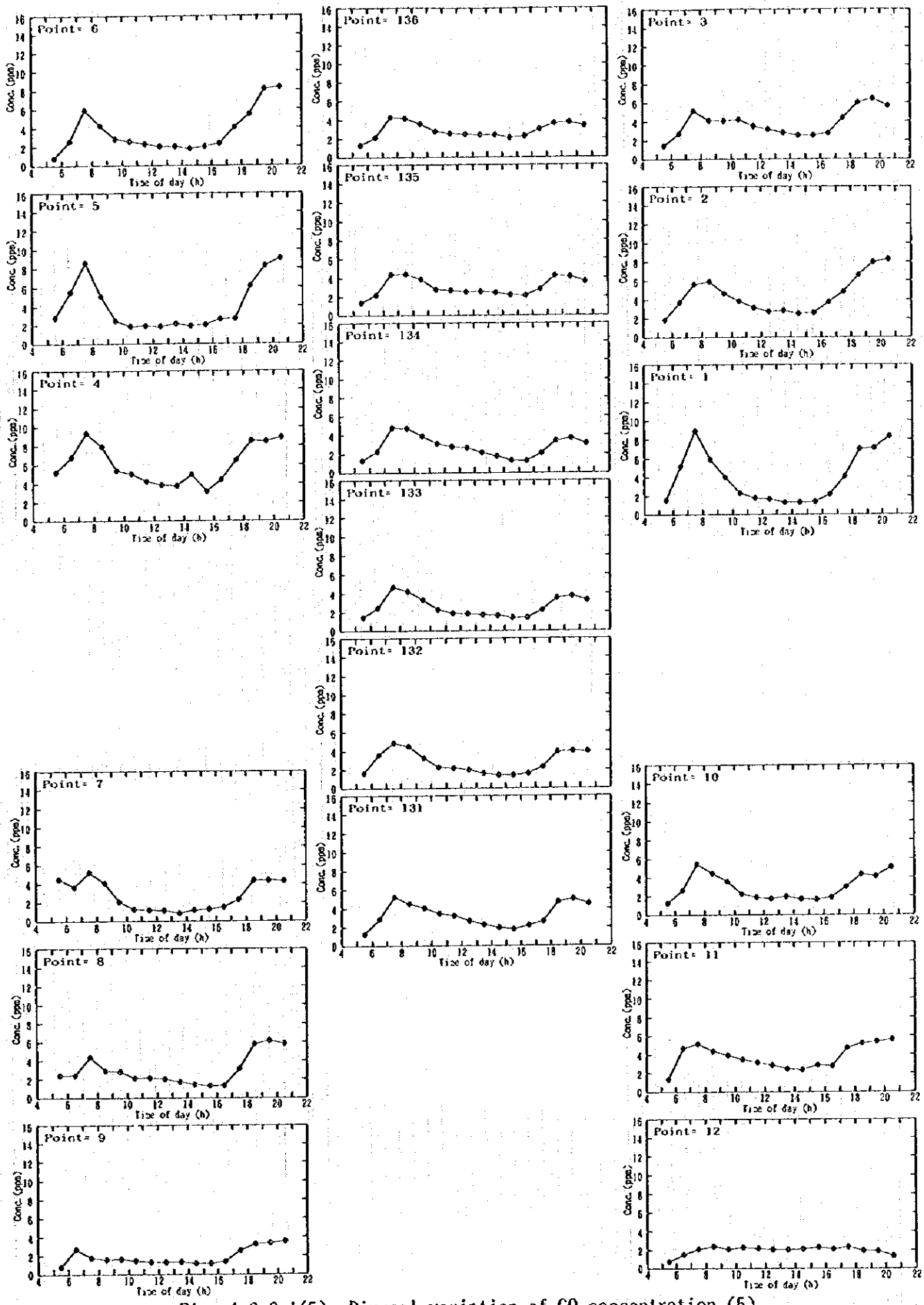


Fig. 4.2.3-1(5) Diurnal variation of CO concentration (5)

Autumn Run0-Run3 Oct. 8, 10, 11, 12 '96 (4 days average)

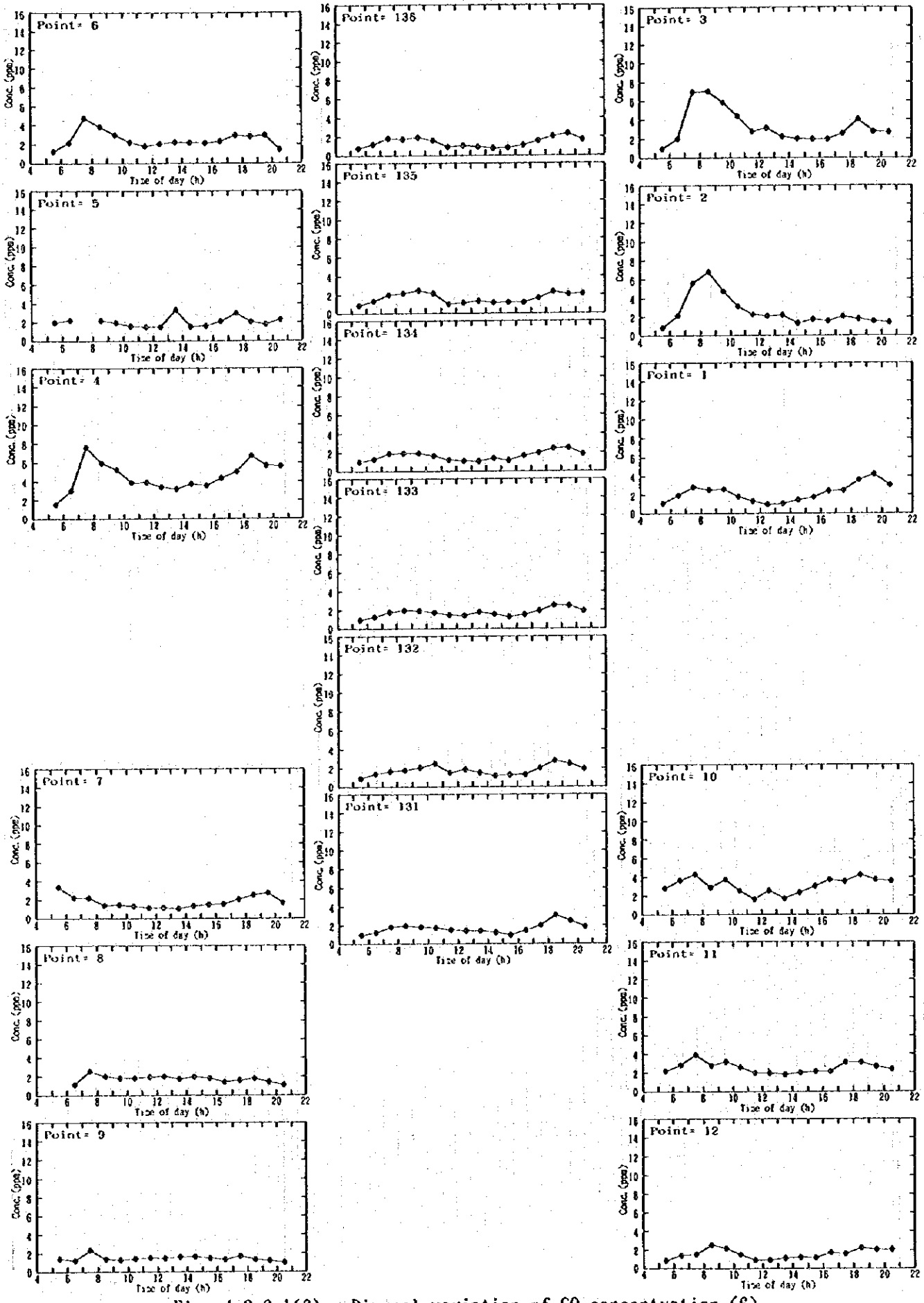


Fig. 4.2.3-1(6) Diurnal variation of CO concentration (6)
Winter - Run 1 Feb. 22 '97

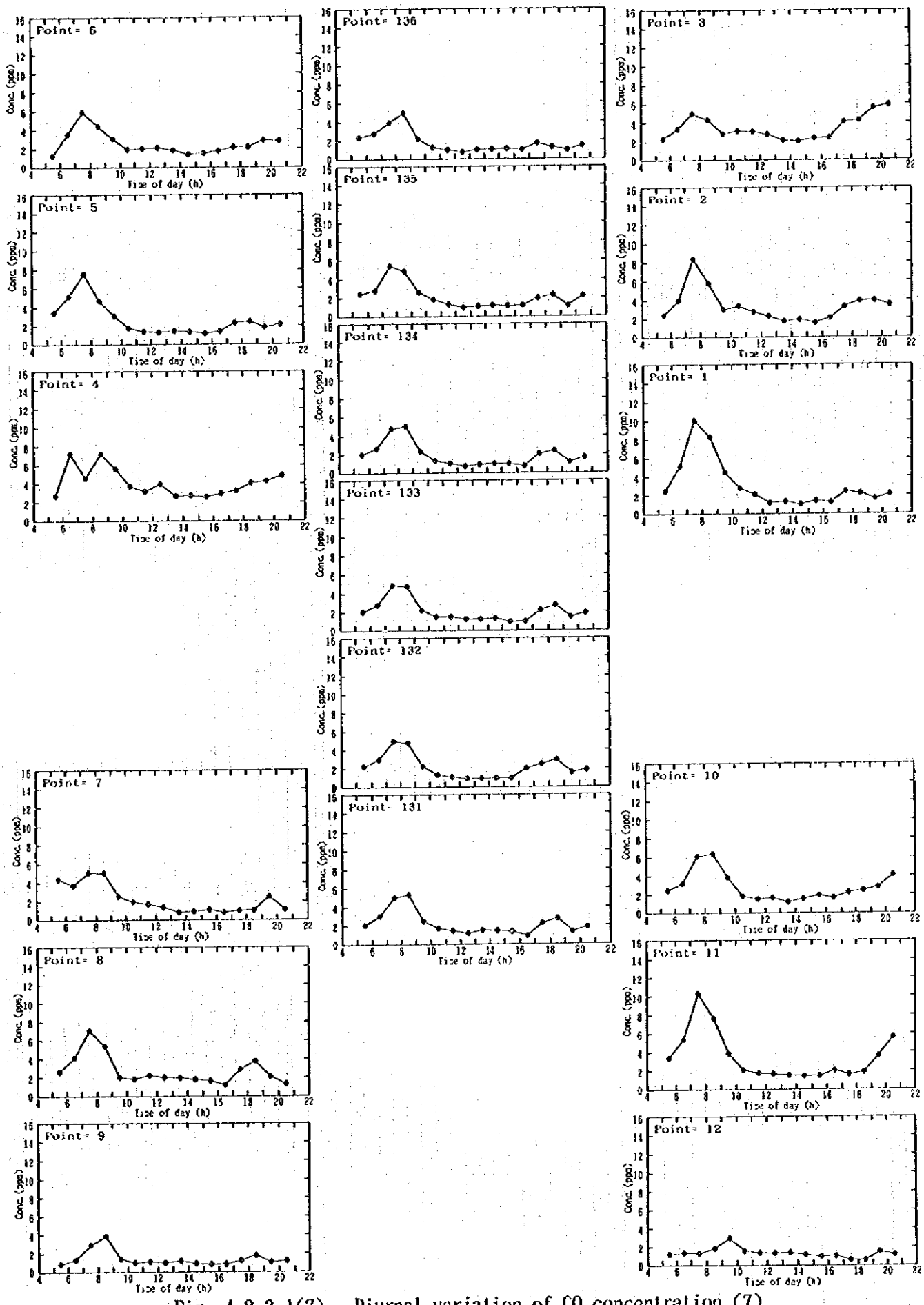


Fig. 4.2.3-1(7) Diurnal variation of CO concentration (7)
Winter - Run 2 Feb. 24 '97

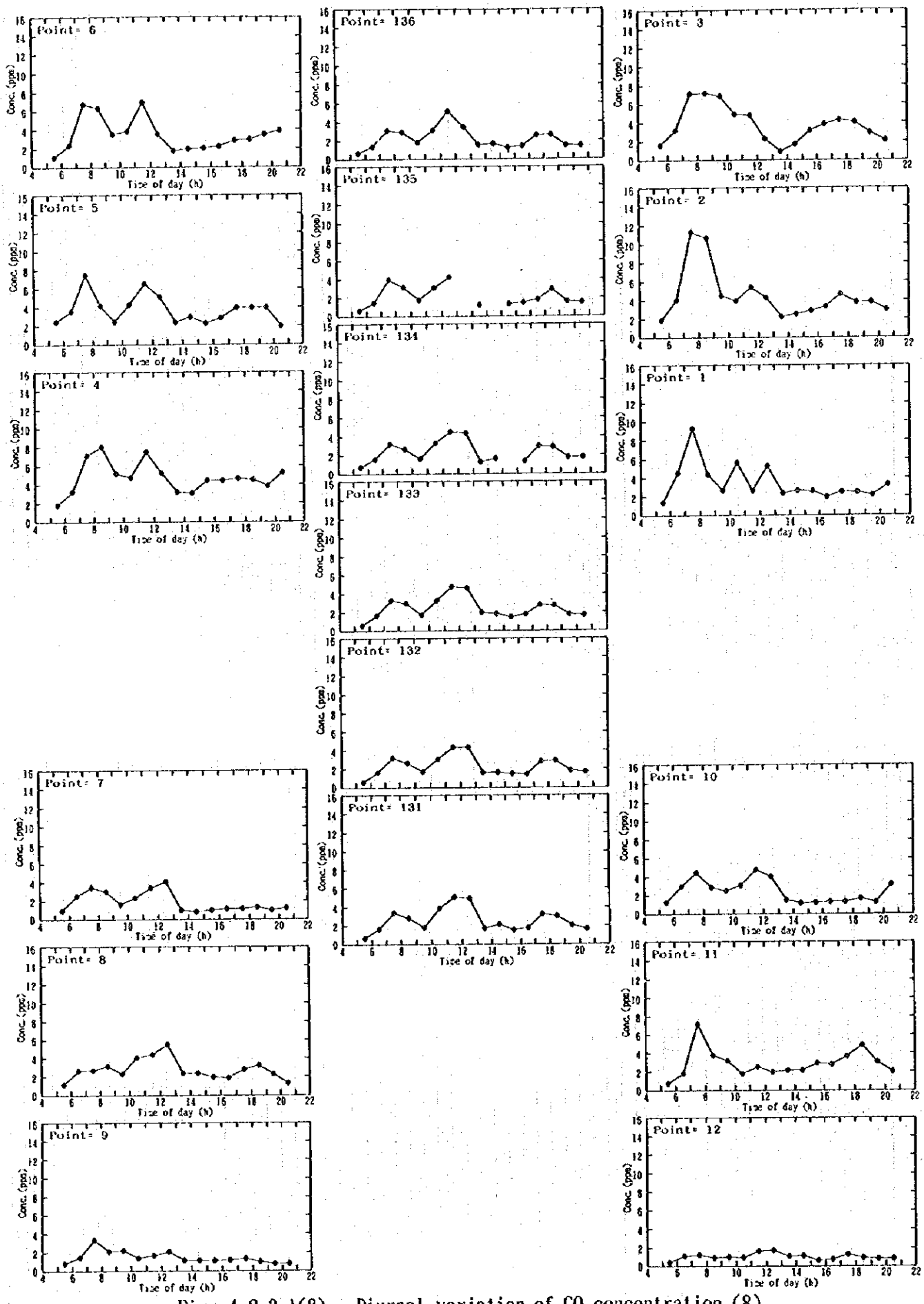


Fig. 4.2.3-1(8) Diurnal variation of CO concentration (8)
Winter - Run 3 Feb. 26 '97

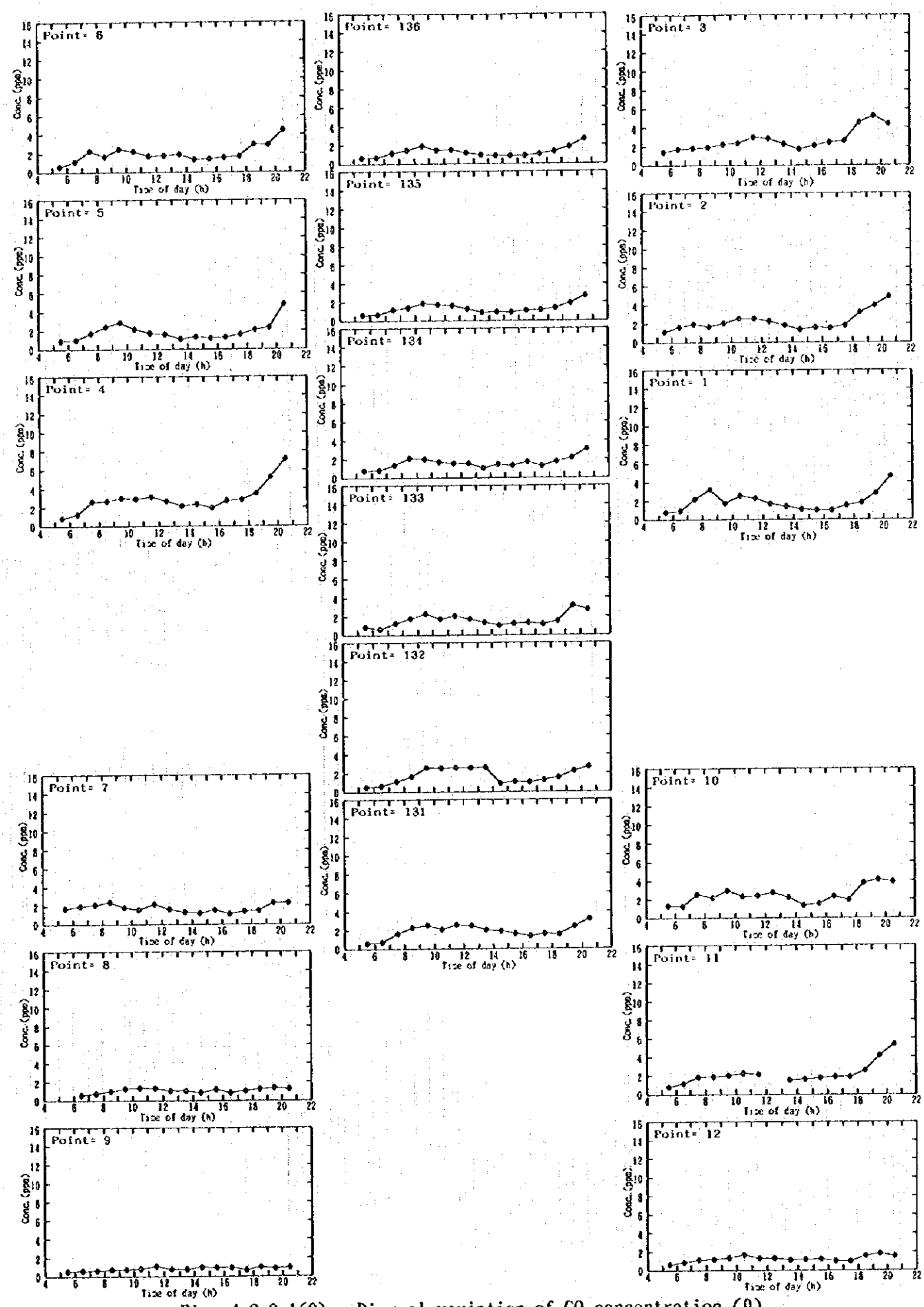


Fig. 4.2.3-1(9) Diurnal variation of CO concentration (9)

Winter - Run 4 Feb. 28 '97

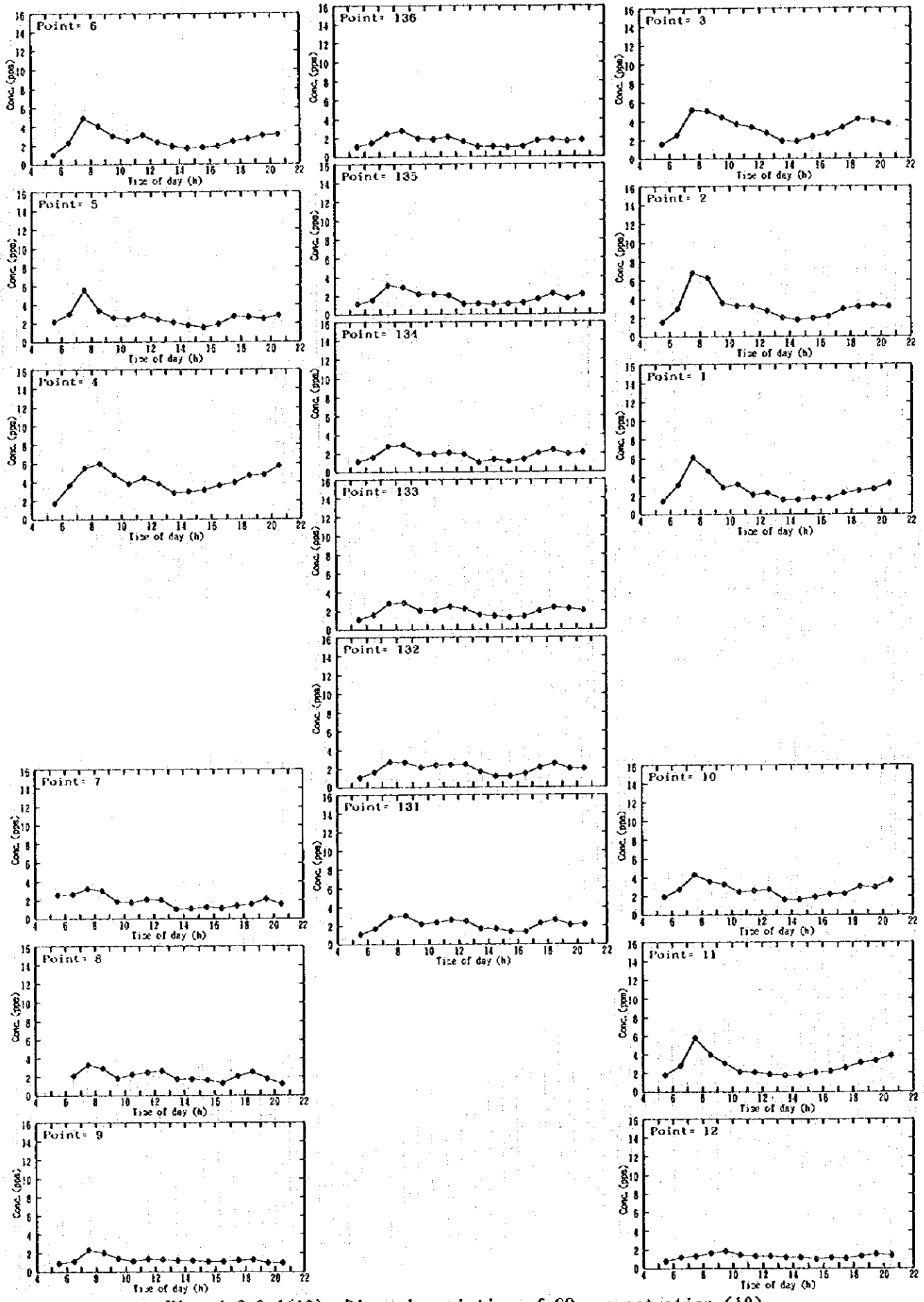


Fig. 4.2.3-1(10) Diurnal variation of CO concentration (10)

Winter Run1-Run4 Feb. 22, 24, 26, 28 '97 (4 days average)

Table 4.2.3-2 Average CO concentration of surface measurement points

a) Autumn (first measurement work)

Sampling time	CO Concentration (ppm)				
	Oct. 8 Tue	Oct. 10 Thu	Oct. 11 Fri	Oct. 12 Sat	Average
1 (05:00-06:00)	2.27	3.18	0.85	1.93	2.03
2 (06:00-07:00)	4.88	4.11	1.19	4.48	3.67
3 (07:00-08:00)	5.13	7.59	1.94	7.62	5.57
4 (08:00-09:00)	4.51	6.00	2.52	4.62	4.41
5 (09:00-10:00)	3.70	4.18	2.30	2.93	3.28
6 (10:00-11:00)	3.00	3.39	2.24	2.13	2.69
7 (11:00-12:00)	2.56	2.62	2.16	2.15	2.37
8 (12:00-13:00)	2.20	2.45	1.87	2.21	2.18
9 (13:00-14:00)	2.12	2.39	1.71	2.15	2.07
10 (14:00-15:00)	2.01	2.59	1.65	1.88	2.03
11 (15:00-16:00)	2.14	2.07	1.68	2.05	1.98
12 (16:00-17:00)	2.48	2.63	1.84	2.57	2.36
13 (17:00-18:00)	3.68	3.90	3.69	3.16	3.61
14 (18:00-19:00)	5.23	4.84	6.31	4.63	5.25
15 (19:00-20:00)	6.93	5.28	6.65	4.37	5.81
16 (20:00-21:00)	7.54	4.58	7.30	4.75	6.01
Average	3.77	3.86	2.87	3.35	3.46

b) Winter (second measurement work)

Sampling time	CO Concentration (ppm)				
	Feb. 22 Sat	Feb. 24 Mon	Feb. 26 Wed	Feb. 28 Fri	Average
1 (05:00-06:00)	1.60	2.44	1.25	0.93	1.55
2 (06:00-07:00)	2.10	3.88	2.70	1.13	2.45
3 (07:00-08:00)	3.85	6.08	5.74	1.75	4.39
4 (08:00-09:00)	3.32	5.35	4.55	1.89	3.78
5 (09:00-10:00)	3.00	3.14	3.06	2.07	2.82
6 (10:00-11:00)	2.36	2.17	3.39	2.09	2.50
7 (11:00-12:00)	1.86	1.95	4.35	2.11	2.57
8 (12:00-13:00)	1.92	1.82	3.80	1.91	2.36
9 (13:00-14:00)	1.90	1.56	1.82	1.63	1.73
10 (14:00-15:00)	1.84	1.48	1.94	1.34	1.65
11 (15:00-16:00)	1.93	1.51	2.13	1.42	1.75
12 (16:00-17:00)	2.14	1.64	2.23	1.52	1.88
13 (17:00-18:00)	2.57	2.27	2.85	1.63	2.33
14 (18:00-19:00)	2.99	2.56	2.89	2.40	2.71
15 (19:00-20:00)	2.69	2.70	2.39	3.01	2.70
16 (20:00-21:00)	2.32	2.90	2.33	3.71	2.82
Average	2.40	2.71	2.96	1.91	2.50

(Note) Each data is average values of surface measurement points.
(Total 13 points ; 1 -12 and 132)

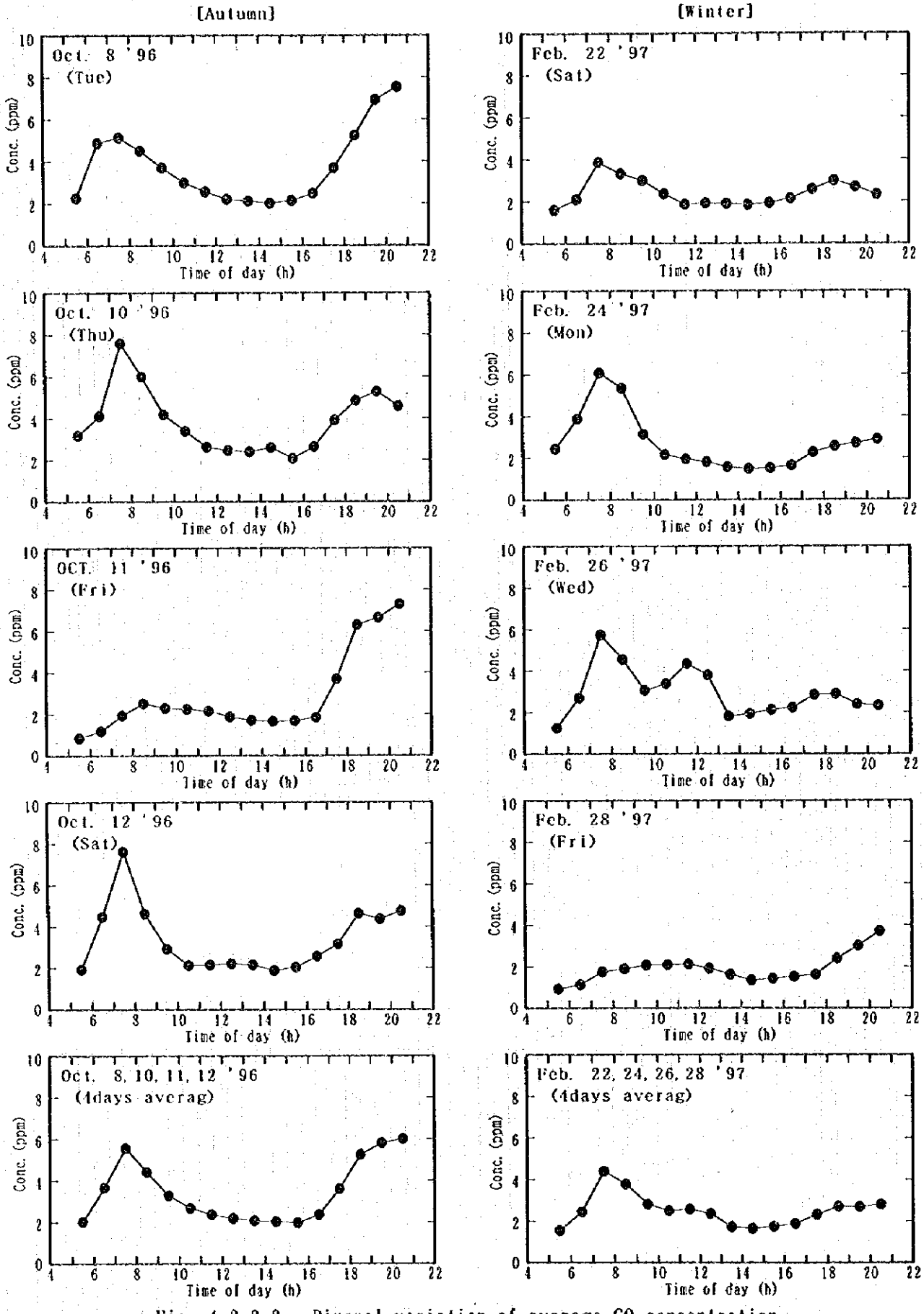


Fig. 4.2.3-2 Diurnal variation of average CO concentration

Average of all surface measurement data for each day of the week

(Total 13 points ; No. 1-12 and 132)

Table 4.2.3-3 Background concentrations of CO and HC

Sampling point	Date of sampling	CO conc (ppm)	HC conc (ppmC)		
			CH_4	NMHC	THC
NE-1	Oct. 17 '96	0.64	1.70	0.31	2.01
NE-2(1)	Oct. 17 '96	1.67	1.82	0.63	2.45
NE-2(2)	Oct. 17 '96		1.85	0.69	2.54
NE-3(1)	Oct. 17 '96	1.47	1.87	0.65	2.52
NE-3(2)	Oct. 17 '96		1.88	0.65	2.53
SW-1	Oct. 18 '96	0.55	1.78	0.39	2.17
SW-2	Oct. 18 '96	0.58	1.73	0.41	2.14
SW-3	Oct. 18 '96	0.59	1.75	0.36	2.11
Koohin	Oct. 18 '96	1.24			
Lastain Abad	Oct. 18 '96	1.45			

<Explanation of Sampling points>

NE-1 : near Lake Latiyan

NE-2 : near Amin Abad (near Zardband)

NE-3 : Ghochak

SW-1 : suburb of Shahriyar

SW-2 : suburb of Shahriyar

SW-3 : suburb of Shahriyar

2) HC

The HC concentration data are shown in Tables 4.2.3-4(1) - (6); i.e. Tables 4.2.3-4(1) - (2) show the data for each day (=run) of the autumn measurement, and Tables 4.2.3-4(3) shows the average data for each sampling point for the autumn measurement, and Tables 4.2.3-4(4) - (5) and (6) show those for the winter measurement. In these tables, the meaning of the mark of "*" is the same with CO, and the data which have two figures divided by "/" are the data of two continuous sampling. Diurnal variation of the CH_4, NMHC and THC concentration is shown in Fig. 4.2.3-3(1) - (10). Fig. 4.2.3-3(1) - (5) show the results of autumn measurement, (1) - (4) show those for each day and (5) for a 4 day average. Fig 4.2.3-3(6) - (10) show the same sets but for winter.

In general, diurnal variations of NMHC and THC are similar to those of CO, though CH_4 shows an almost constant value. In the autumn measurement, the NMHC and THC concentrations show two peaks in the morning and in the late evening and sink like a basin in the daytime. On the other hand, in the winter measurement, variations of both NMHC and THC are almost constant from morning to late evening, and both concentrations are low. These concentrations are almost the same with those measured in the autumn daytime. In addition, the concentrations of CH_4 in both measurement periods are almost equal. The difference between CH_4 and NMHC (THC) is supposed to be derived from their origins: CH_4 comes mainly from natural sources, while NMHC is produced not only by natural sources but also by human activities like combustion of fossil fuels.

In addition, the HC concentration data in the spring measurement are shown in Appendix 4.2.3-B; the list and diurnal variation of HC are shown in Tables 4.3.2-B1(1) - (2) and Fig. 4.3.2-B1(1) - (4), respectively. In general, the concentrations of NMHC and THC in spring are between those of autumn and winter, while the CH_4 concentration is almost same with other two seasons. Diurnal variations of the NMHC and THC concentration in spring are also similar to those of CO in spring; high in the morning and low in the day with a small peak in the evening; though the CH_4 concentration is almost constant.

Table 4.2.3-4(1) HC Concentration (1)

Autumn - Run 0
Oct. 8 '96

Sampling time	HC Concentration (ppmC)														
	Point=3			Point=6			Point=8			Point=10			Point=132		
	CH4	NMHC	THC	CH4	NMHC	THC	CH4	NMHC	THC	CH4	NMHC	THC	CH4	NMHC	THC
1 (05:00-05:05)	- *	- *	- *				3.34 *	5.65 *	8.99 *	2.82/2.95*	1.40/1.71*	4.22/4.66*	2.50 *	1.23 *	3.73 *
2 (06:00-06:05)				2.48 *	2.16 *	4.64 *				2.93/2.75*	1.67/1.47*	4.60/4.22*	4.22	2.63	6.85
3 (07:00-07:05)													3.16	3.09	6.25
4 (08:00-08:05)	2.52	1.69	4.21	1.95	1.26	3.21	3.47	1.71	5.18	3.10 *	3.17 *	6.27 *	2.49	1.90	4.39
5 (09:00-09:05)													2.35	1.79	4.15
6 (10:00-10:05)													2.31	1.73	4.04
7 (11:00-11:05)	- *	- *	- *	2.05	1.53	3.58	2.36	0.80	3.16	2.68	1.55	4.23	2.22	1.02	3.26
8 (12:00-12:05)													2.16	0.76	2.91
9 (13:00-13:05)													2.07	0.95	3.02
10 (14:00-14:05)													1.92	0.61	2.52
11 (15:00-15:05)													1.92	0.73	2.66
12 (16:00-16:05)	2.05	1.70	3.75	1.84	0.82	2.65	- *	- *	- *	2.03/2.08	0.98/0.93	3.01/3.01	1.85	0.66	2.52
13 (17:00-17:05)													1.91	0.96	2.87
14 (18:00-18:05)	2.20	2.90	5.10	1.98	1.60	3.58	1.93	1.84	3.78	2.61/2.65	2.31/2.28	4.92/4.94	2.23	2.11	4.35
15 (19:00-19:05)													2.75	5.11	7.86
16 (20:00-20:05)	2.38	3.11	5.50	2.12	3.26	5.38	1.84/2.60*	0.84/2.78*	3.48/4.85*	2.86/2.90	3.65/3.62	6.52/6.53	3.28	5.45	8.74

Autumn - Run 1
Oct. 10 '96

Sampling time	HC Concentration (ppmC)														
	Point=3			Point=6			Point=8			Point=10			Point=132		
	CH4	NMHC	THC	CH4	NMHC	THC	CH4	NMHC	THC	CH4	NMHC	THC	CH4	NMHC	THC
1 (05:00-05:05)	2.68	1.68	4.37	1.93	0.80	2.73	2.57 *	2.74 *	5.32 *	3.15	1.54	4.69	3.79 *	4.97 *	8.76 *
2 (06:00-06:05)													3.23	3.64	6.87
3 (07:00-07:05)													2.93	2.73	5.66
4 (08:00-08:05)	2.21	2.19	4.40	2.01	3.15	5.16	2.13	2.37	4.51	2.70	2.21	4.92	2.47	2.63	5.11
5 (09:00-09:05)													2.68	3.55	6.23
6 (10:00-10:05)													2.04	1.77	3.81
7 (11:00-11:05)	1.99	1.59	3.58	1.85	0.92	2.78	1.83	1.12	2.95	2.19	1.22	3.42	1.90	0.84	2.74
8 (12:00-12:05)													1.82	0.88	2.71
9 (13:00-13:05)													1.77	0.63	2.40
10 (14:00-14:05)													1.81	0.65	2.46
11 (15:00-15:05)													1.76	0.36	2.12
12 (16:00-16:05)	1.82	0.66	2.48	1.78	0.74	2.51	1.78	1.00	2.79	1.89	0.46	2.35	1.84	0.66	2.49
13 (17:00-17:05)													2.05	1.45	3.50
14 (18:00-18:05)	2.06	2.45	4.52	2.00	2.12	4.12	2.10	2.23	4.33	2.13	1.08	3.20	2.12	1.56	3.68
15 (19:00-19:05)													2.10	1.27	3.37
16 (20:00-20:05)	2.14	2.24	4.38	2.27	3.97	6.25	2.01	2.34	4.35	2.35	1.16	3.51	2.15	1.26	3.42

(Notes) -: Missed data. *: data which includes some error. /: continuouce 2 time sampling data.

Table 4.2.3-4(2) HC Concentration (2)

Autumn - Run 2
Oct. 11 '96

Sampling time	HC Concentration (ppmC)														
	Point=3			Point=6			Point=8			Point=10			Point=132		
	CH4	NMHC	THC	CH4	NMHC	THC	CH4	NMHC	THC	CH4	NMHC	THC	CH4	NMHC	THC
1 (05:00-05:05)	1.87	0.33	2.21				2.08 *	0.77 *	2.84 *	2.52	- *	- *	2.13	0.57	2.70
2 (06:00-06:05)				1.89 *	0.74 *	2.63 *							2.32	0.64	2.96
3 (07:00-07:05)													2.13	0.60	2.73
4 (08:00-08:05)	2.18	1.33	3.52	2.30	1.95	4.26	2.37	2.95	5.32	2.21	0.53	2.74	2.15	1.02	3.18
5 (09:00-09:05)													2.38	1.17	3.56
6 (10:00-10:05)													2.01	0.38	2.39
7 (11:00-11:05)	2.15	1.07	3.22	1.91	0.67	2.59	2.06	0.58	2.65	2.17	0.76	2.93	2.09	0.62	2.71
8 (12:00-12:05)													1.98	0.36	2.38
9 (13:00-13:05)													1.90	0.41	2.31
10 (14:00-14:05)													1.97	0.34	2.31
11 (15:00-15:05)													1.96	0.31	2.27
12 (16:00-16:05)	1.88	0.58	2.47	1.77	0.40	2.17	1.79	0.86	2.65	1.89	0.68	2.58	1.83	0.41	2.24
13 (17:00-17:05)													1.75	0.71	2.46
14 (18:00-18:05)	1.92	1.36	3.28	1.89	2.79	4.68	1.85	3.21	5.06	2.16	2.32	4.48	2.06	1.69	3.76
15 (19:00-19:05)													2.33	6.74	9.07
16 (20:00-20:05)	2.11 *	2.10 *	4.21 *	2.12	2.78	4.90	2.18	2.99	5.18	2.74	1.77	4.52	2.42	5.80	8.21

Autumn - Run 3
Oct. 12 '96

Sampling time	HC Concentration (ppmC)														
	Point=3			Point=6			Point=8			Point=10			Point=132		
	CH4	NMHC	THC	CH4	NMHC	THC	CH4	NMHC	THC	CH4	NMHC	THC	CH4	NMHC	THC
1 (05:00-05:05)	2.29	1.20	3.49	1.89	1.79	3.68	2.56	2.01	4.58	2.58	0.79	3.37	2.43	1.79	4.22
2 (06:00-06:05)													2.72	2.31	5.02
3 (07:00-07:05)													3.32	3.21	6.54
4 (08:00-08:05)	1.98	1.41	3.39	1.78	1.31	3.10	2.19	2.43	4.63	2.99	2.65	5.65	2.55	3.19	5.74
5 (09:00-09:05)													2.30	1.98	4.28
6 (10:00-10:05)													1.80	0.80	2.61
7 (11:00-11:05)	1.84	1.05	2.89	1.77	0.98	2.76	1.78	0.74	2.52	1.88	0.83	2.71	1.78	0.61	2.39
8 (12:00-12:05)													1.80	0.72	2.51
9 (13:00-13:05)													1.78	0.57	2.35
10 (14:00-14:05)													1.75	0.59	2.34
11 (15:00-15:05)													1.76	0.65	2.42
12 (16:00-16:05)	1.82	1.01	2.83	1.74 *	0.79 *	2.52 *	1.76	1.06	2.82	1.93	1.14	3.07	1.77	0.64	2.41
13 (17:00-17:05)													1.83	1.05	2.88
14 (18:00-18:05)	2.07	2.21	4.28	1.84	1.01	2.85	1.87	1.70	3.57	2.16	1.64	3.81	1.93	1.55	3.48
15 (19:00-19:05)													2.10	1.88	3.98
16 (20:00-20:05)	2.17	2.39	4.57	1.91	1.52	3.44	1.97	2.01	3.98	2.28	1.97	4.25	1.98	1.47	3.44

(Notes) - ; Missed data. * ; data which includes some error. / ; continuouce 2 time sampling data.

Table 4.2.3-4(3) HC Concentration (3)

Autumn Run 0-3
4 days average (Oct. 8,10,11,12 '96)

Sampling time	HC Concentration (ppmC)														
	Point=3			Point=6			Point=8			Point=10			Point=132		
	CH4	NMHC	THC	CH4	NMHC	THC	CH4	NMHC	THC	CH4	NMHC	THC	CH4	NMHC	THC
1 (05:00-05:05)	2.28 *	1.07 *	3.36 *	- *	- *	- *	2.64 *	2.79 *	5.43 *	2.89 *	1.35 *	4.24 *	2.71 *	2.14 *	4.85 *
2 (06:00-06:05)													3.12	2.31	5.42
3 (07:00-07:05)													2.89	2.41	5.30
4 (08:00-08:05)	2.22	1.66	3.88	2.01	1.92	3.93	2.54	2.37	4.91	2.75 *	2.14 *	4.90 *	2.42	2.19	4.61
5 (09:00-09:05)													2.43	2.12	4.56
6 (10:00-10:05)													2.04	1.17	3.21
7 (11:00-11:05)	1.99 *	1.24 *	3.23 *	1.90	1.03	2.93	2.01	0.81	2.82	2.23	1.09	3.32	2.00	0.77	2.78
8 (12:00-12:05)													1.94	0.68	2.63
9 (13:00-13:05)													1.88	0.64	2.52
10 (14:00-14:05)													1.86	0.55	2.41
11 (15:00-15:05)													1.85	0.51	2.37
12 (16:00-16:05)	1.89	0.99	2.88	1.78 *	0.69 *	2.46 *	1.78 *	0.97 *	2.75 *	1.95	0.80	2.75	1.82	0.59	2.42
13 (17:00-17:05)													1.89	1.04	2.93
14 (18:00-18:05)	2.06	2.23	4.30	1.93	1.88	3.81	1.94	2.25	4.19	2.28	1.83	4.11	2.09	1.73	3.82
15 (19:00-19:05)													2.32	3.75	6.07
16 (20:00-20:05)	2.20 *	2.46 *	4.67 *	2.11	2.88	4.99	2.19 *	2.53 *	4.59 *	2.57	2.13	4.70	2.46	3.50	5.95

(Notes) - ; Missed data. * ; data which includes some error.

Table 4.2.3-4(4) HC Concentration (4)

Winter - Run 1
Feb. 22 '97

Sampling time	HC Concentration (ppmC)														
	Point=3			Point=6			Point=8			Point=10			Point=132		
	CH4	NMHC	THC	CH4	NMHC	THC	CH4	NMHC	THC	CH4	NMHC	THC	CH4	NMHC	THC
1 (05:00-05:10)	1.80	0.49	2.29	1.94 *	0.77 *	2.71 *	-*	-*	-*	2.27	0.74	3.01	1.98	1.49	3.47
2 (06:00-06:10)													2.30	1.20	3.50
3 (07:00-07:10)													1.97	1.00	2.97
4 (08:00-08:10)	2.31	2.53	4.84	1.86	1.35	3.21	1.83	0.93	2.76	2.03	1.00	3.03	1.88	0.95	2.83
5 (09:00-09:10)													1.97	1.20	3.17
6 (10:00-10:10)													1.99	0.91	2.90
7 (11:00-11:10)	1.93	1.11	3.05	1.99	0.88	2.87	-*	-*	-*	1.92	0.64	2.55	1.94	0.83	2.77
8 (12:00-12:10)													1.80	0.51	2.31
9 (13:00-13:10)													1.75	0.53	2.28
10 (14:00-14:10)													1.74	0.55	2.29
11 (15:00-15:10)													1.71	0.55	2.25
12 (16:00-16:10)	1.76	0.74	2.50	1.70	0.88	2.53	1.73	0.66	2.39	1.86	0.81	2.68	1.73	0.65	2.37
13 (17:00-17:10)													1.75	0.87	2.63
14 (18:00-18:10)	1.88	0.94	2.83	1.71	1.00	2.71	1.76	0.80	2.55	1.85	0.85	2.70	1.79	1.12	2.91
15 (19:00-19:10)													1.85	1.19	3.04
16 (20:00-20:10)	1.82	0.83	2.66	1.70	0.88	2.58	1.85	0.68	2.52	1.92	1.17	3.08	1.89	0.96	2.85

Winter - Run 2
Feb. 24 '97

Sampling time	HC Concentration (ppmC)														
	Point=3			Point=6			Point=8			Point=10			Point=132		
	CH4	NMHC	THC	CH4	NMHC	THC	CH4	NMHC	THC	CH4	NMHC	THC	CH4	NMHC	THC
1 (05:00-05:10)	2.11	1.11	3.22	1.69 *	0.48 *	2.16 *	-*	-*	-*	3.43 *	1.55 *	4.97 *	3.50	2.39	5.89
2 (06:00-06:10)													2.56	1.39	3.95
3 (07:00-07:10)													2.51	1.83	4.34
4 (08:00-08:10)	2.28 *	1.82 *	4.10 *	2.32	1.66	3.98	2.96	4.22	7.18	2.74	2.26	4.99	2.40	2.45	4.85
5 (09:00-09:10)													2.17	1.63	3.80
6 (10:00-10:10)													1.77	0.78	2.55
7 (11:00-11:10)	1.94	1.16	3.11	1.75	1.08	2.84	1.80	0.48	2.28	1.91	0.69	2.61	1.80	0.75	2.55
8 (12:00-12:10)													1.73	0.52	2.25
9 (13:00-13:10)													1.72	0.45	2.16
10 (14:00-14:10)													1.75	0.61	2.36
11 (15:00-15:10)													1.74	0.62	2.35
12 (16:00-16:10)	1.81	0.92	2.74	1.72	0.57	2.28	1.75	0.67	2.35	2.03	0.72	2.76	1.74	0.49	2.23
13 (17:00-17:10)													1.72	0.47	2.19
14 (18:00-18:10)	1.95	1.87	3.82	1.76	0.63	2.40	1.84	1.17	3.02	2.15	0.59	2.74	1.85	1.13	2.98
15 (19:00-19:10)													1.75 *	0.42 *	2.17 *
16 (20:00-20:10)	2.12	2.17	4.29	1.89	1.01	2.90	1.77	0.71	2.48	2.09	1.12	3.22	1.90 *	0.62 *	2.52 *

(Notes) -; Missed data. *; data which includes some error.

Table 4.2.3-4(5) HC Concentration (5)

Winter - Run 3
Feb. 26 '97

Sampling time	HC Concentration (ppmC)														
	Point=3			Point=6			Point=8			Point=10			Point=122		
	CH4	NMHC	THC	CH4	NMHC	THC	CH4	NMHC	THC	CH4	NMHC	THC	CH4	NMHC	THC
1 (05:00-05:10)	2.03	0.64	2.67	1.86	0.45	2.31	2.08	0.88	2.97	2.03	0.48	2.51	2.09	0.62	2.71
2 (06:00-06:10)													2.10	0.68	2.78
3 (07:00-07:10)													2.15	1.05	3.20
4 (08:00-08:10)	2.44	2.14	4.58	2.45	2.53	4.98	2.13	1.85	3.98	2.42	1.16	3.58	2.57	1.75	4.32
5 (09:00-09:10)													2.00	1.31	3.31
6 (10:00-10:10)													2.18	1.31	3.49
7 (11:00-11:10)	2.32	2.14	4.46	2.14	1.81	3.94	2.07	1.76	3.73	2.34	1.40	3.74	2.25	2.10	4.35
8 (12:00-12:10)													2.41	2.72	5.13
9 (13:00-13:10)													1.88	0.86	2.74
10 (14:00-14:10)													1.79	0.76	2.53
11 (15:00-15:10)													1.73	1.00	2.73
12 (16:00-16:10)	1.80	1.21	3.02	1.71	0.78	2.48	1.78	0.93	2.72	1.85	0.69	2.55	1.74	1.01	2.75
13 (17:00-17:10)													1.75	1.13	2.87
14 (18:00-18:10)	1.84	1.48	3.32	1.73	0.93	2.66	1.74	0.85	2.59	1.82	0.59	2.42	1.77	1.34	3.11
15 (19:00-19:10)													1.76	1.31	3.07
16 (20:00-20:10)	1.78	1.00	2.08	1.78	1.19	2.96	1.92	0.89	2.82	2.03	1.06	3.09	1.80	1.06	2.86

Winter - Run 4
Feb. 28 '97

Sampling time	HC Concentration (ppmC)														
	Point=3			Point=6			Point=8			Point=10			Point=132		
	CH4	NMHC	THC	CH4	NMHC	THC	CH4	NMHC	THC	CH4	NMHC	THC	CH4	NMHC	THC
1 (05:00-05:10)	2.35	0.84	3.19	1.75	0.35	2.11	2.08	1.77	0.46	1.96	0.45	2.41	1.85	0.42	2.27
2 (06:00-06:10)													1.93	0.50	2.44
3 (07:00-07:10)													1.95	0.62	2.57
4 (08:00-08:10)	2.13	0.90	3.03	2.13	0.75	2.88	2.13 *	1.78 *	0.57 *	2.05	0.72	2.77	2.00	0.73	2.74
5 (09:00-09:10)													2.11	0.95	3.06
6 (10:00-10:10)													2.10	1.01	3.12
7 (11:00-11:10)	1.99	1.35	3.34	1.84	0.72	2.57	2.07	1.81	0.63	1.96	0.98	2.95	2.00	0.79	2.79
8 (12:00-12:10)													1.86	0.60	2.46
9 (13:00-13:10)													1.82	0.53	2.35
10 (14:00-14:10)													1.82	0.51	2.34
11 (15:00-15:10)													1.82	0.54	2.36
12 (16:00-16:10)	1.90	0.78	2.68	1.75	0.50	2.26	1.78	1.77	0.59	1.91	0.74	2.65	1.81	0.49	2.31
13 (17:00-17:10)													1.80	0.49	2.30
14 (18:00-18:10)	2.01	1.15	3.17	1.80 *	0.86 *	2.65 *	1.74	1.77	0.79	1.96	0.94	2.89	1.86	0.70	2.56
15 (19:00-19:10)													1.92	0.80	2.72
16 (20:00-20:10)	2.21	1.57	3.78	1.85	1.77	3.62	1.92	1.85	0.99	2.26	1.50	3.76	1.98	1.16	3.14

(Notes) - : Missed data. * : data which includes some error.

Table 4.2.3-4(6) HC concentration(6)

Winter Run 1-4
4 days average (Feb. 22,24,26,28 '97)

Sampling time	HC Concentration (ppmC)														
	Point=3			Point=6			Point=8			Point=10			Point=132		
	CH4	NMHC	THC	CH4	NMHC	THC	CH4	NMHC	THC	CH4	NMHC	THC	CH4	NMHC	THC
1 (05:00-05:10)	2.07	0.77	2.84	1.81 *	0.51 *	2.32 *	- *	- *	- *	2.42 *	0.81 *	3.23 *	2.36	1.23	3.59
2 (06:00-06:10)													2.22	0.94	3.17
3 (07:00-07:10)													2.15	1.13	3.27
4 (08:00-08:10)	2.29 *	1.85 *	4.14 *	2.19	1.57	3.76	2.18 *	1.89 *	4.07 *	2.31	1.29	3.59	2.21	1.47	3.69
5 (09:00-09:10)													2.06	1.27	3.34
6 (10:00-10:10)													2.01	1.00	3.02
7 (11:00-11:10)	2.05	1.44	3.49	1.93	1.12	3.06	1.89 *	0.96 *	2.82 *	2.03	0.93	2.96	2.00	1.12	3.12
8 (12:00-12:10)													1.95	1.09	3.04
9 (13:00-13:10)													1.79	0.59	2.38
10 (14:00-14:10)													1.78	0.61	2.38
11 (15:00-15:10)													1.75	0.68	2.42
12 (16:00-16:10)	1.82	0.91	2.74	1.72	0.67	2.39	1.76	0.70	2.46	1.91	0.74	2.66	1.76	0.66	2.42
13 (17:00-17:10)													1.76	0.74	2.50
14 (18:00-18:10)	1.92	1.36	3.29	1.75 *	0.86 *	2.61 *	1.78	0.90	2.68	1.95	0.74	2.69	1.82	1.07	2.89
15 (19:00-19:10)													1.82 *	0.93 *	2.75 *
16 (20:00-20:10)	1.98	1.39	3.38	1.81	1.21	3.02	1.85	0.82	2.67	2.08	1.21	3.29	1.89 *	0.95 *	2.84 *

(Notes) -; Missed data. *; data which includes some error.

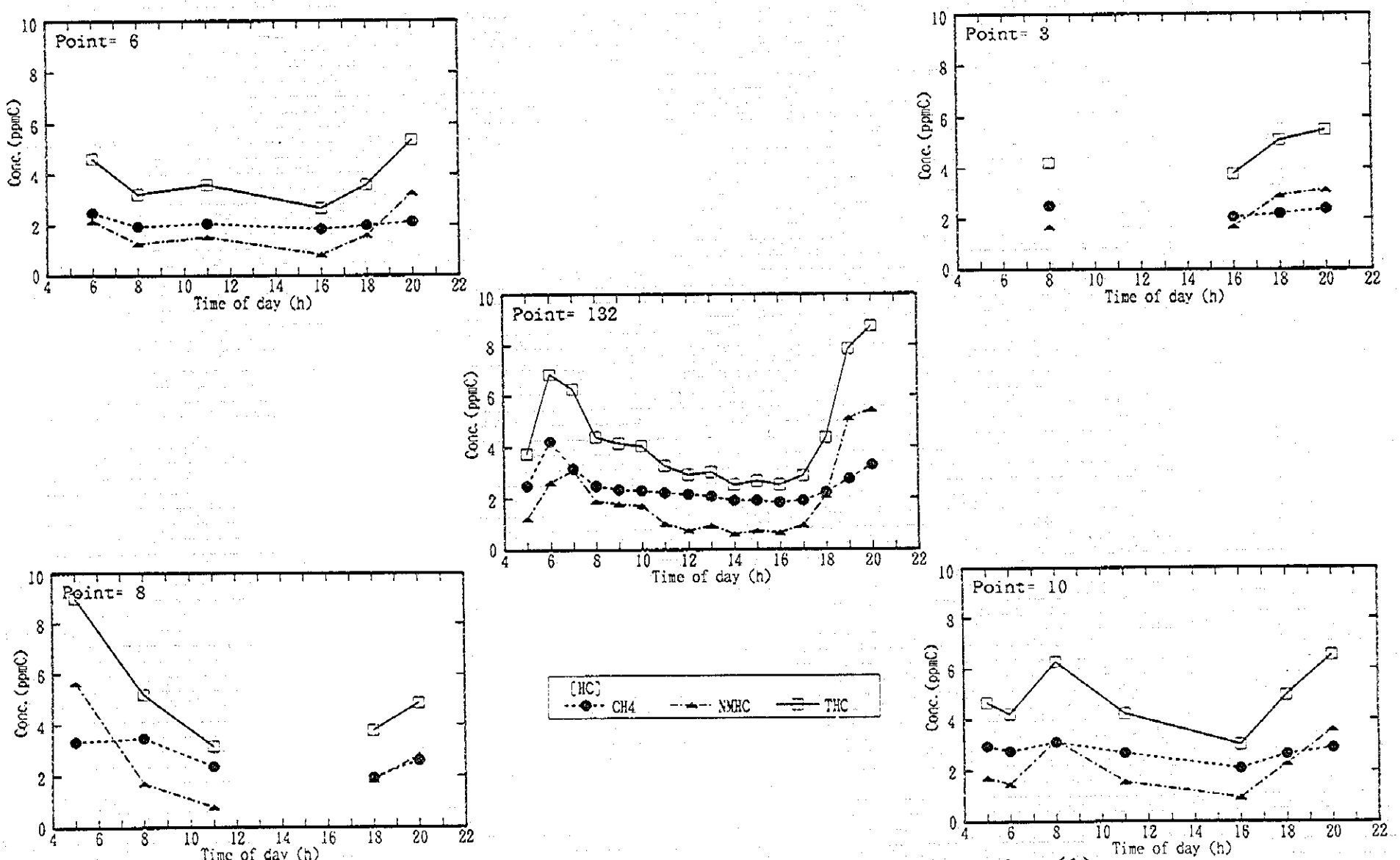


Fig. 4.2.3-3(1) Diurnal variation of HC concentration (1)
Autumn - Run 0 Oct. 8 '96

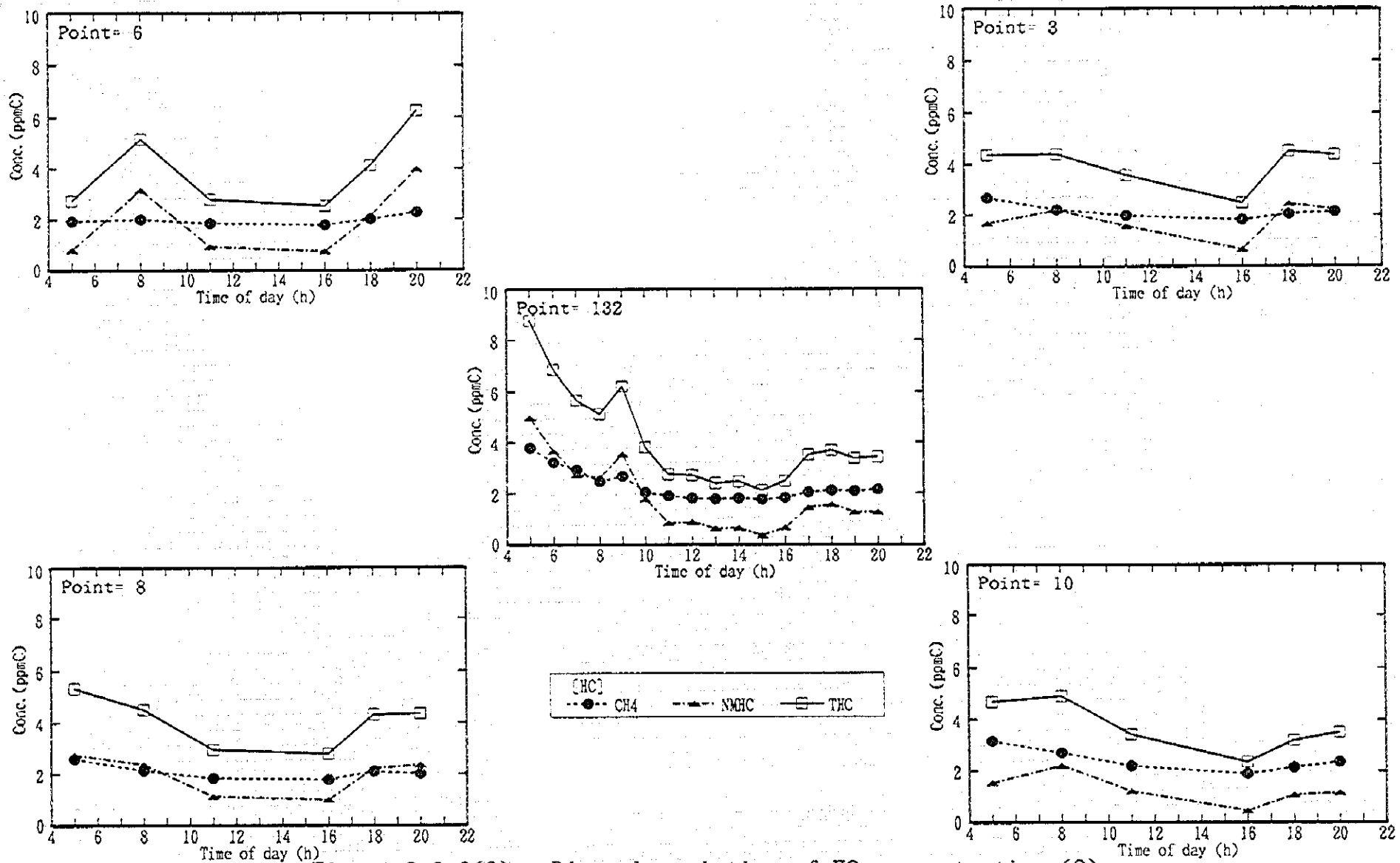


Fig. 4.2.3-3(2) Diurnal variation of HC concentration (2)

Autumn - Run 1 Oct. 10 '96

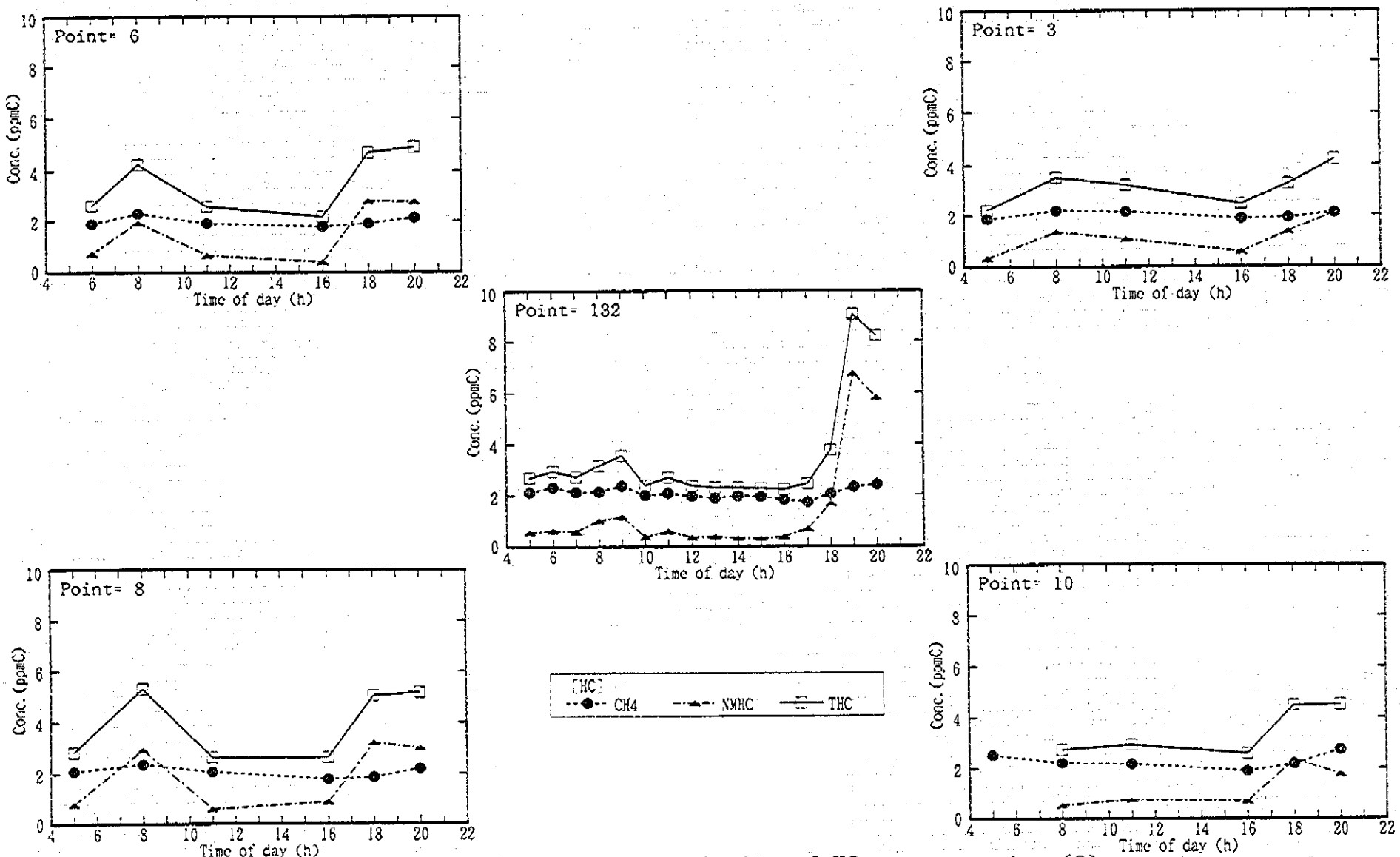


Fig. 4.2.3-3(3) Diurnal variation of HC concentration (3)
Autumn - Run 2 OCT. 11 '96

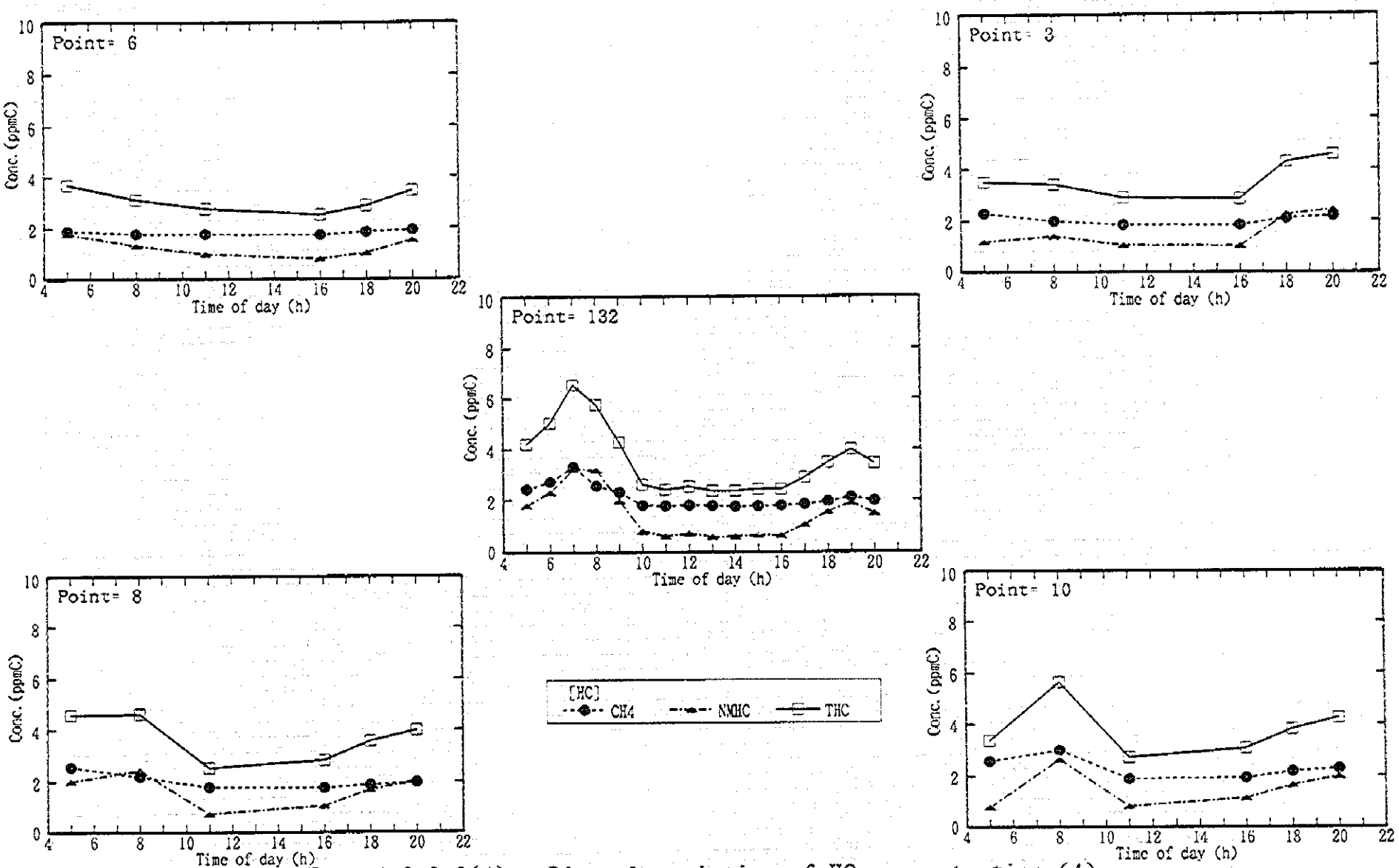


Fig. 4.2.3-3(4) Diurnal variation of HC concentration (4)

Autumn - Run 3 Oct. 12 '96

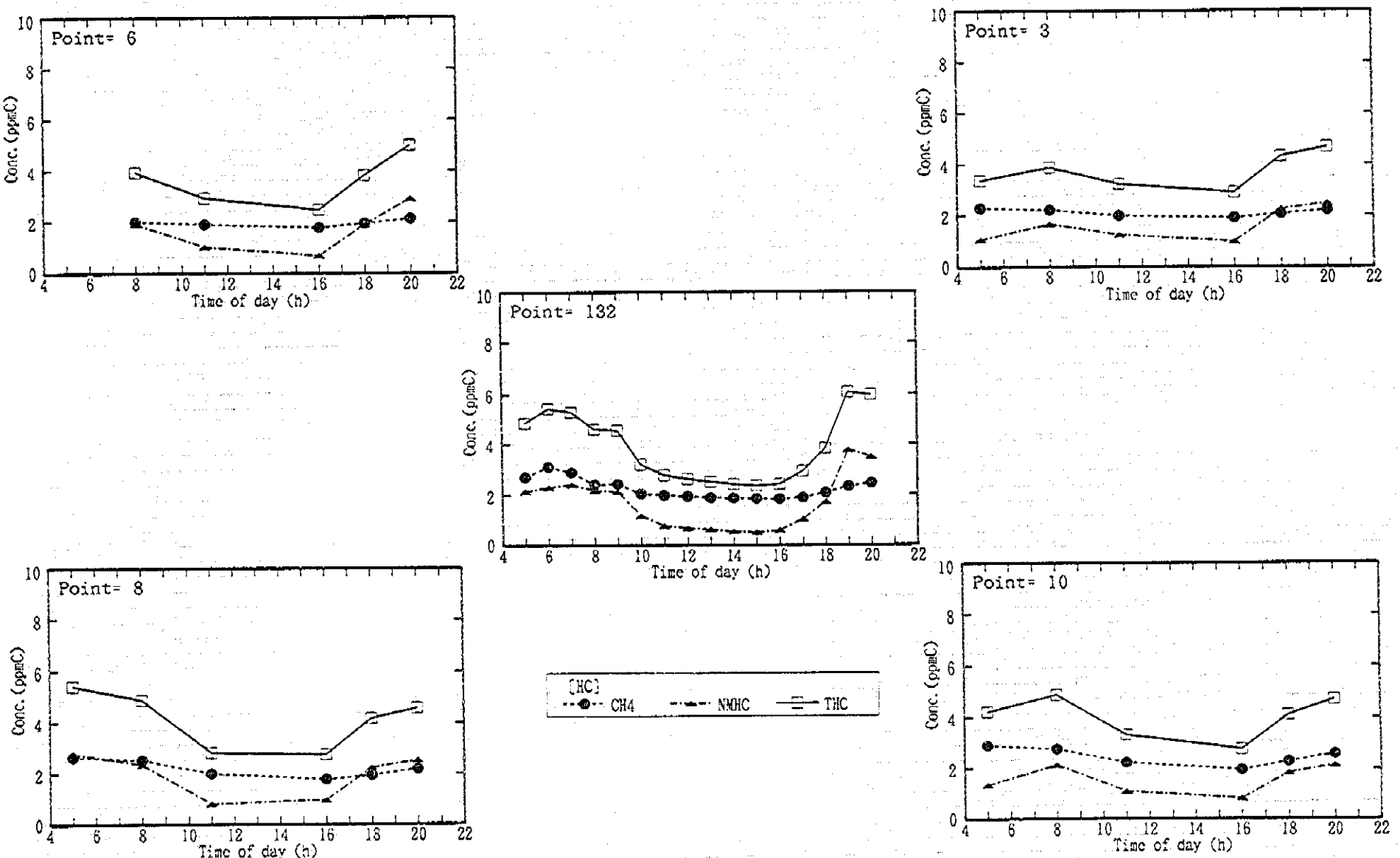


Fig. 4.2.3-3(5) Diurnal variation of HC concentration (5)

Autumn Run0-Run3 Oct. 8, 10, 11, 12 '96 (4 days average)

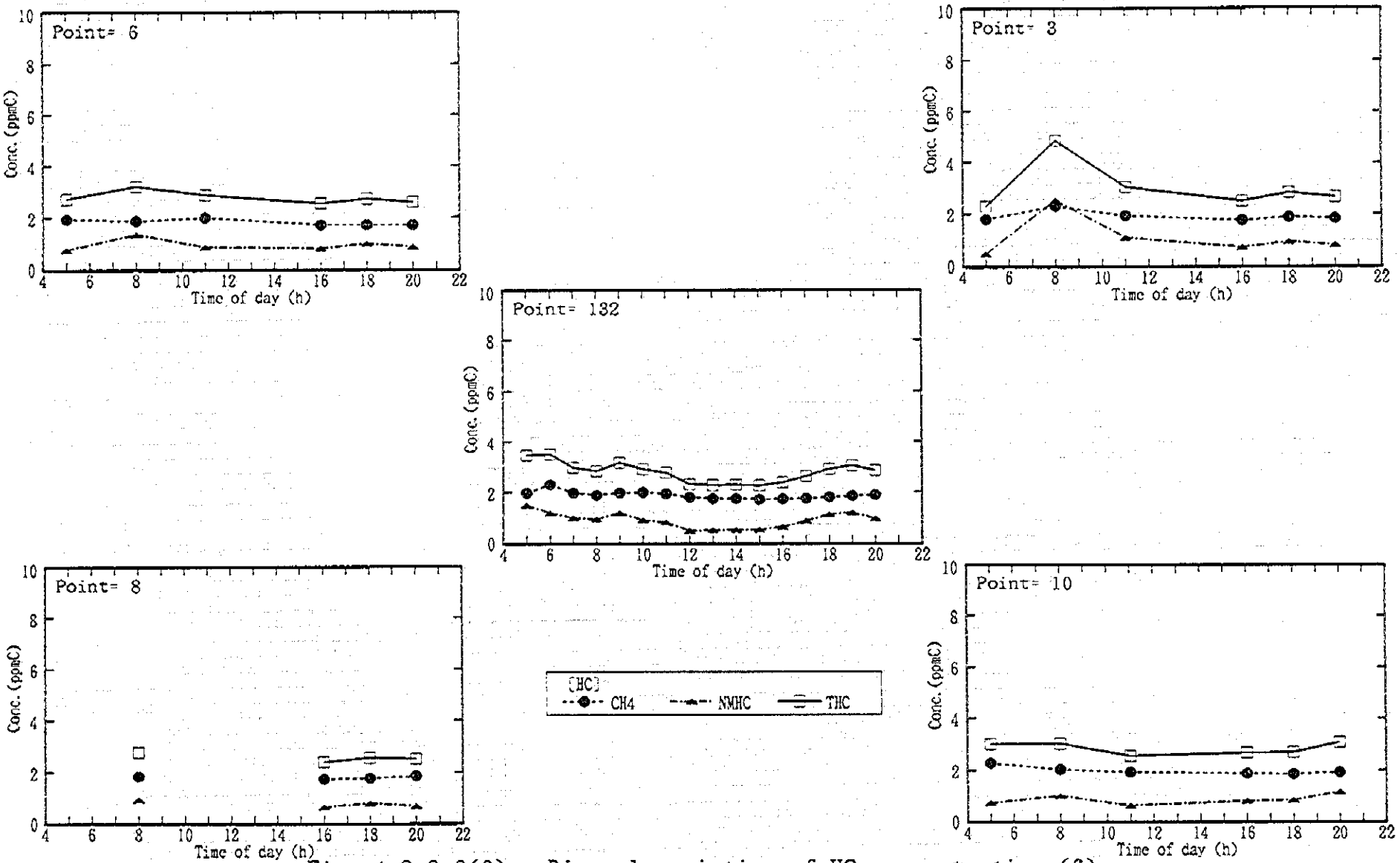


Fig. 4.2.3-3(6) Diurnal variation of HC concentration (6)

Winter - Run 1 Feb. 22 '97

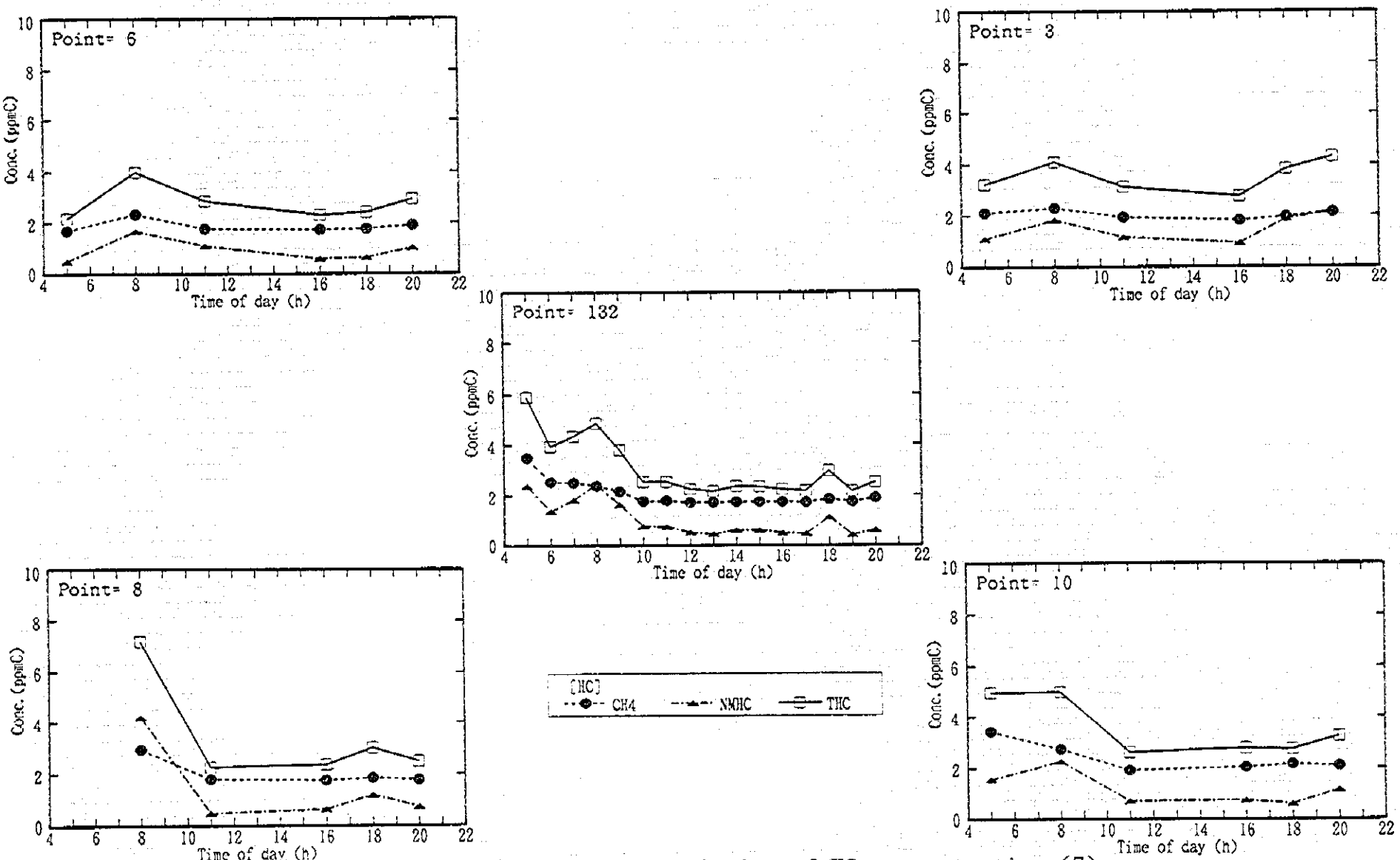


Fig. 4.2.3-3(7) Diurnal variation of HC concentration (7)
Winter - Run 2 Feb. 24 '97

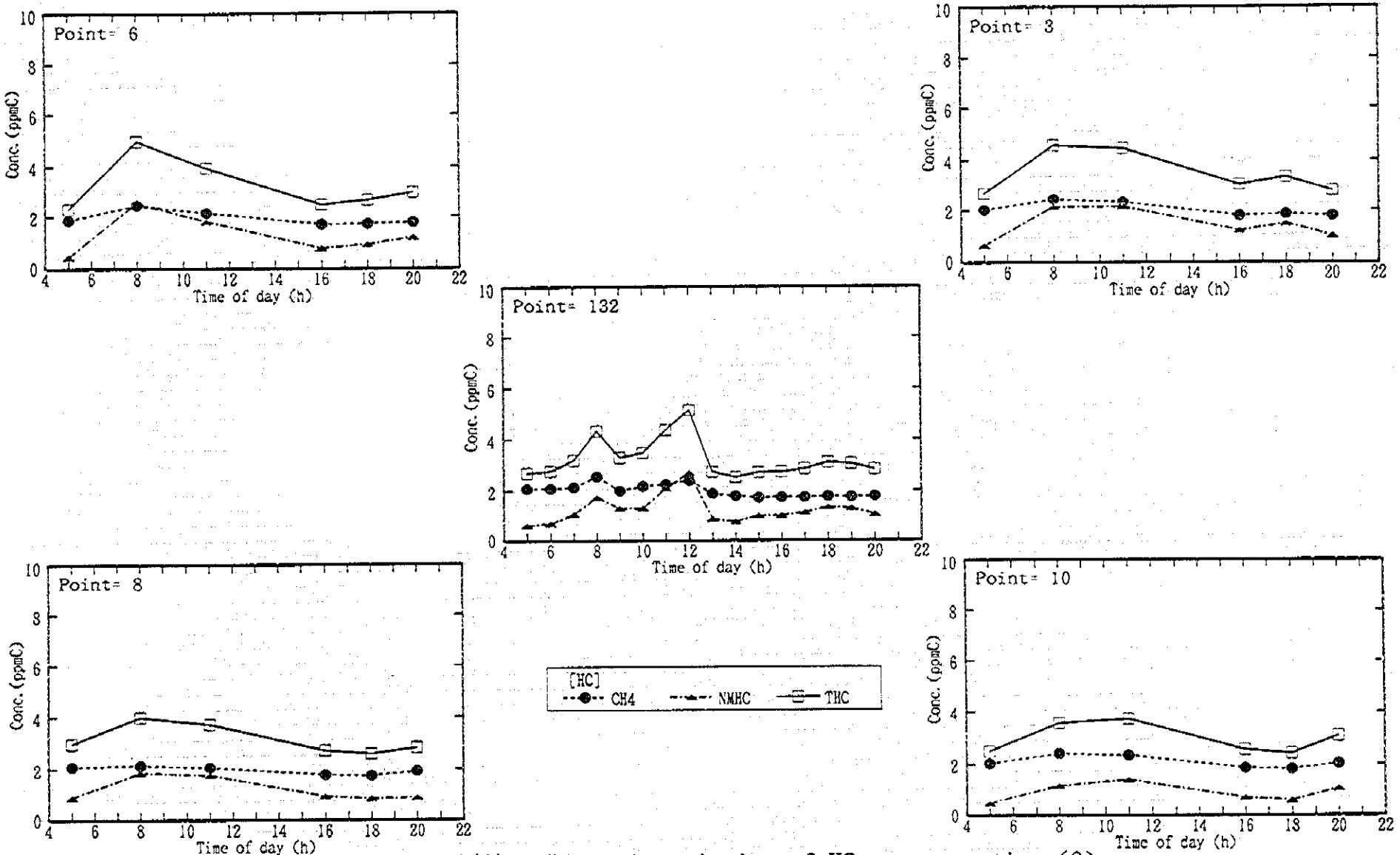


Fig. 4.2.3-3(8) Diurnal variation of HC concentration (8)
Winter - Run 3 Feb. 26 '97

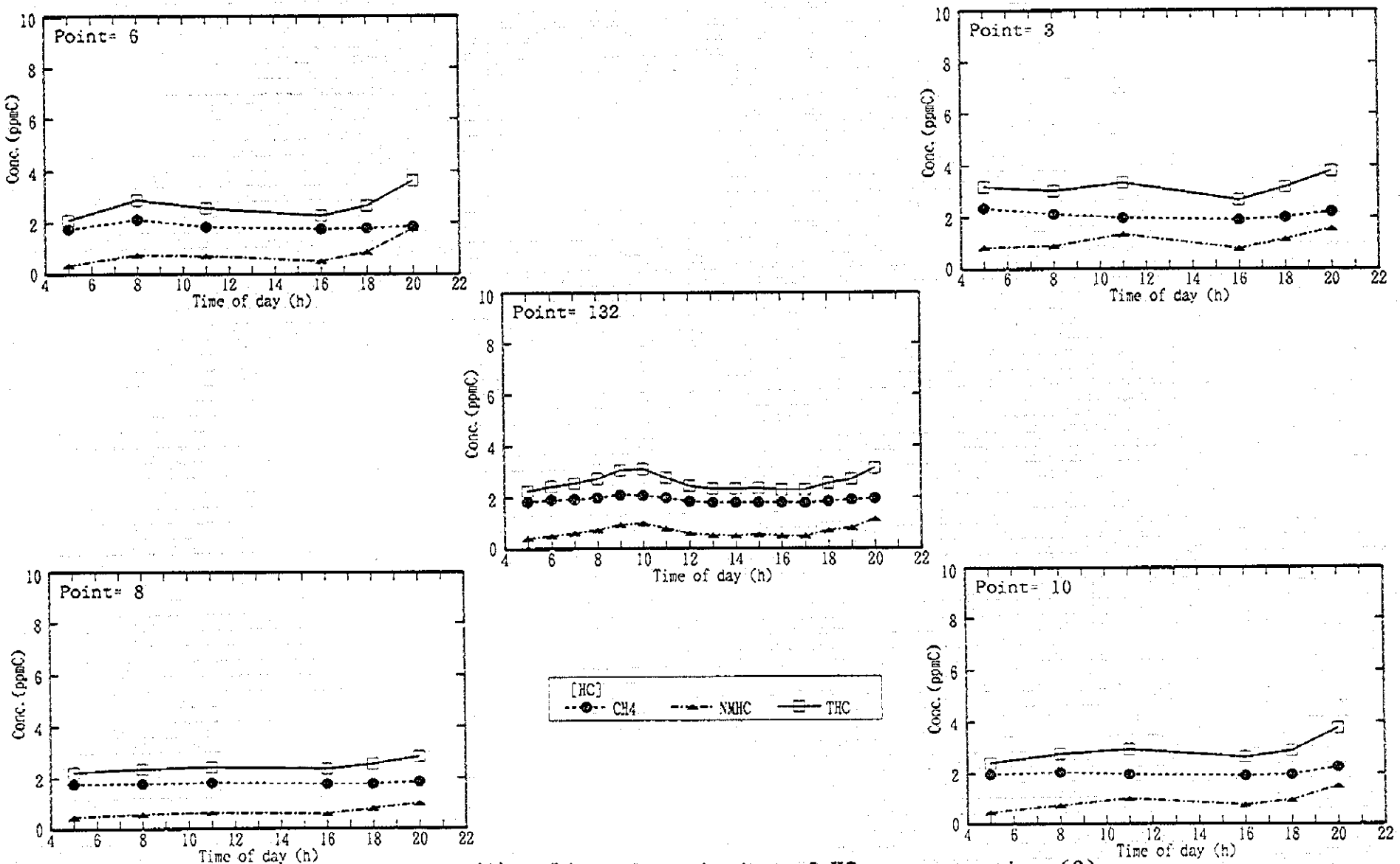


Fig. 4.2.3-3(9) Diurnal variation of HC concentration (9)

Winter - Run 4 Feb. 28 '97

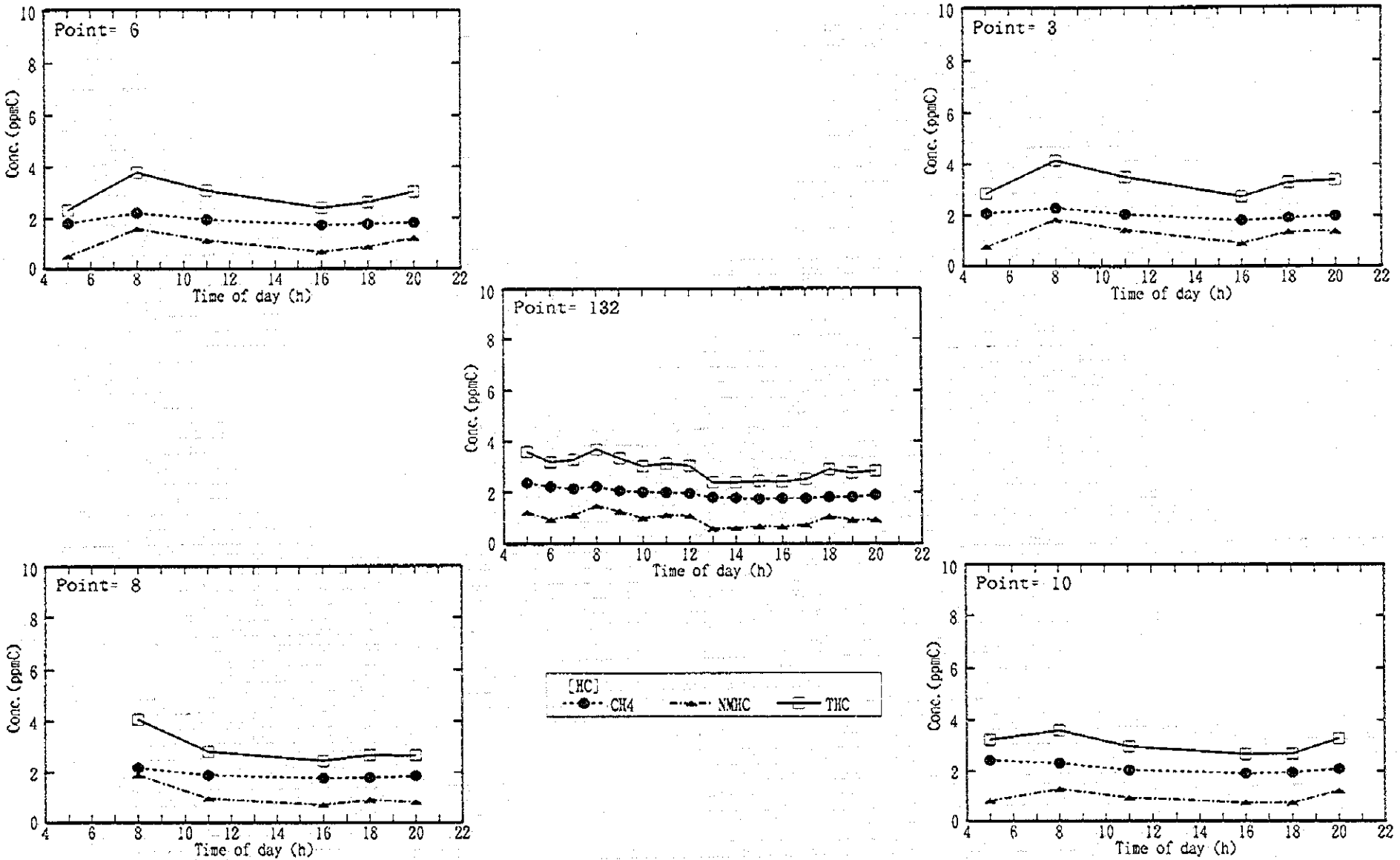


Fig. 4.2.3-3(10) Diurnal variation of HC concentration (10)

Winter Run1-Run4 Feb. 22.24.26.28 '97 (4 days average)

3) NOx and SO_2

NO_2 concentration data are shown in Tables 4.2.3-5(1) - (2). As mentioned in 3.4.2, NO data are not available because of the troubles of NOx filters in both periods. Distribution of NO_2 plotted on the map is shown in Fig. 4.2.3-4(1) - (6); i.e. Fig 4.2.3-4(1) - (3) show the data for the autumn measurement and (4) - (6) the ones for the winter measurement. A cycle of sampling is about 24 hours, starting at 13 - 14h and ending at about the same time on the next day. It should be noticed that the concentrations at point No. 18 are higher than at the other points, because this point is located very near a crossroad. Generally, the NO_2 concentration in the center part of MOT is slightly higher than that of the outskirts of MOT.

Daily variation of the NO_2 concentration is shown in Fig. 4.2.3-5(1) - (2). In general, the concentration in autumn is higher than that in winter in the same way with CO and HC. NO_2 variations depending on the day of the week are not clear for both measurement periods. In the autumn measurement, slight decrease in the concentration during the weekend (from Thursday to Saturday) is seen. On the other hand, in winter, the variation does not seem to depend on the day of the week.

The SO_2 concentration data are shown in Table 4.2.3-6. Distribution of SO_2 plotted on the map is shown in Fig. 4.2.3-6(1) - (2) in the same style with Fig. 4.2.3-4, while SO_2 variation is shown in Fig. 4.2.3-7(1) - (2) in the same style with Fig. 4.2.3-5. In general, the SO_2 concentration in the center and a little southern part of MOT is barely higher than the northern part for both periods. In contrast to other pollutants, the SO_2 concentration in winter is higher than that in autumn. This tendency is similar to the result of the monitoring station's data analysis mentioned in 4.2.1.

Comparison between the NO_2 and SO_2 concentrations is shown in Fig. 4.2.3-8(1) - (2). Among these figures, the NO_2 concentration is the average value for the same periods with those used for SO_2, i.e. 3 days in autumn and 4 days in winter. It is difficult to find out any relationship between NO_2 and SO_2. This may be explained by the difference in the way of production of them; namely, SO_2 is the primary pollutant originated in the combustion of fossil fuel, while NO_2 is a secondary pollutant produced by oxidation of NO mainly emitted from motor vehicles. Compared to SO_2, consequently, the NO_2 concentration is more changeable influenced by the distance from sources and by other pollutants, especially O_3.

In addition, the NO_2 concentration data in the spring measurement are shown in Appendix 4.2.3-C. NO data are useless because of the same reason with the winter measurement mentioned above. SO_2 data have been incomplete. In general, the NO_2 concentration in spring is the same with that in autumn and higher than that in winter. And like in autumn, the NO_2 concentration slightly decreases on the weekend, from Thursday to Saturday.

Table 4.2.3-5 (1) NO2 Concentration using passive sampler (1)

Autumn (First measurement work) unit=ppb

Point No.	1 day sampling data								Average
	Run 0 (10/8-10/9) Tue-Wed	Run 1 (10/9-10/10) Wed-Thu	Run 2 (10/10-10/11) Thu-Fri	Run 3 (10/11-10/12) Fri-Sat	Run 4 (10/12-10/13) Sat-Sun	Run 5 (10/13-10/14) Sun-Mon	Run 6 (10/14-10/15) Mon-Tue	Run 7 (10/15-10/16) Tue-Wed	Run 0-7 (10/8-10/16)
1	52	43	33	31	38	44	43	42	41
2	57	47	33	37	34	44	45	39	42
3	67	54	40	40	39	43	61	41	48
4	57	53	41	44	40	52	55	45	48
5	63	46	36	33	32	41	40	44	42
6	36	31	42	32	29	34	37	45	36
7	58	47	31	37	37	47	39	39	42
8	65	40	38	39	38	52	25	39	42
9	51	28	33	33	35	37	23	-	31
10	59	46	27	29	37	38	43	42	40
11	35	49	29	34	37	42	43	41	39
12	22	27	18	20	25	19	35	32	25
13	47	44	28	28	41	35	39	40	38
14	61	50	34	33	39	39	50	41	43
15	46	51	27	30	42	31	43	44	39
16	46	51	37	31	46	44	49	47	44
17	61	50	39	38	52	43	45	42	46
18	101	60	56	45	56	61	42	50	59
19	37	45	30	36	36	37	33	34	36
20	37	23	18	18	25	28	16	19	23
21	56	55	38	41	43	48	42	43	46
22	38	34	41	27	35	37	33	40	35
23	38	37	40	31	30	37	24	37	34
24	55	60	48	39	45	49	47	49	49
25	36	30	29	19	26	23	12	35	26
26	39	35	28	19	28	25	22	33	29
27	50	41	35	23	35	38	30	38	36
28	47	38	25	19	35	28	36	35	33
29	44	24	10	13	27	25	29	29	25
30		35	30	26	33	30	24	30	30
31			39	31	40	43	50	42	41
Average	50	43	33	31	37	38	37	39	38

(Note) - ; Missed data

Table 4.2.3-5 (2) NO2 Concentration using passive sampler (2)

Winter (Second measurement work) unit=ppb

Point No.	1 day sampling data								Average
	Run 0 (2/21-2/22) Fri-Sat	Run 1 (2/22-2/23) Sat-Sun	Run 2 (2/23-2/24) Sun-Mon	Run 3 (2/24-2/25) Mon-Tue	Run 4 (2/25-2/26) Tue-Wed	Run 5 (2/26-2/27) Wed-Thu	Run 6 (2/27-2/28) Thu-Fri	Run 7 (2/28-3/1) Fri-Sat	Run 0-7 (2/21-3/1)
1	25	19	32	27	30	24	19	38	27
2	23	18	29	31	36	21	24	42	28
3	28	26	38	34	35	26	25	45	32
4	34	29	39	34	39	33	28	39	34
5	29	14	29	37	35	24	19	34	28
6	26	20	27	26	32	23	18	33	26
7	34	20	32	32	31	30	17	-	28
8	21	15	25	25	32	21	19	22	22
9	15	18	25	17	23	16	14	19	18
10	29	22	31	26	28	23	23	35	28
11	35	27	40	39	26	33	24	40	33
12	19	27	29	23	9	24	15	26	21
13	24	16	29	25	23	20	18	33	24
14	24	17	32	26	31	21	26	39	27
15	25	16	30	33	30	24	23	34	27
16	35	24	35	38	36	30	33	39	34
17	31	30	42	35	36	28	29	38	34
18	51	26	45	50	45	35	22	44	40
19	19	20	32	28	25	18	12	22	22
20	11	10	14	15	36	8	3	10	13
21	35	20	35	33	41	28	22	35	31
22	21	13	25	24	33	17	8	29	21
23	16	15	22	20	25	18	11	22	19
24	29	14	31	31	34	25	24	39	29
25	25	10	15	8	25	11	21	21	17
26	14	9	19	19	22	7	24	30	18
27	16	14	30	8	23	16	20	37	21
28	22	15	22	20	15	14	24	38	21
29	20	14	14	7	13	17	18	39	18
30	20	15	22	21	26	18	5	25	19
31	30	24	31	14	32	28	28	46	29
Average	25	19	29	26	29	22	20	33	25

(Note) - ; Missed data